Final Report

Regional Industrial Land Study
for the
Portland – Vancouver
Metropolitan Area

prepared by
Otak, Inc.

In Association with
Hammer Siler George Associates
Golder Associates

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Advisory Committee

- Clackamas County — Renate Mengelberg
- Columbia River Economic Development Council — Pamela Neal
- Commercial Real Estate Economic Coalition — Rick Williams and Wally Hobson
- Metropolitan Service District (Metro) — Dennis Yee
- Oregon Economic Development Department — Marcy Jacobs
- Port of Portland — Mary Gibson, Scott Drumm and Justin Bates
- Portland Development Commission — Mike Ogan
- Portland General Electric — Greg Satchell

Project Sponsors

- Governor's Community Response Funds
- Metro (Multnomah/Washington County) Regional Strategies Board
- Mount Hood Economic Alliance
- Northwest Natural Gas
- Oregon State Lottery Funds
- PacifiCorp
- Portland General Electric
- Port of Portland
- Portland Development Commission
- Commercial Real Estate Economic Coalition

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Table of Contents

List of Figures

List of Tables

List of Charts

Appendices

Executive Summary

Introduction

Since current information on industrial lands was found to be insufficient in the Portland-Vancouver Primary Metropolitan Statistical Area (PMSA), several public, quasi-public and private agencies agreed to cooperate and conduct this detailed Regional Industrial Land Study. The intent of this study is to:

- Identify 20-year industrial land needs based on regional job growth forecasts and market trends;
- Provide a detailed up-to-date industrial lands inventory using a newly developed Geographic Information System (GIS) land classification system;
- Consider the effects of development constraints, such as parcel size and environmental issues, on land absorption and our region's ability to meet job growth forecasts.
- Determine if there are any significant discrepancies in the availability of buildable industrial lands to accommodate expected job growth.

This study builds upon Phase 1 industrial focus group input by addressing many of the technical issues raised by focus group participants. As such, this Phase 2 study effort sheds light on the relationship between regional industrial land supply and industrial land demand based on job projections. While policy considerations are identified, a full discussion of policy alternatives and economic development consequences are the subject of a follow-up Phase 3 effort.

Economic Overview

Historically, the economy of the Portland-Vancouver PMSA was based on industries that capitalized on the region's unique natural resources and river and ocean access. With early 19th century economic roots as a "trading post" for furs, wheat, lumber and fish, the region has successfully expanded into broader trades, specialized high-tech manufacturing, and a variety of service occupations. Features of the Portland-Vancouver PMSA include:

- Presence of the second oldest international shipping port on the West Coast;
- Port activity that leads the nation in wheat shipments, and is among the fastest growing container ports on the West Coast;
- Location as a transportation hub at the confluence of railroad, barge, airport, and interstate highway facilities;
- A regional economy with over 1.8 million residents and 1.15 million jobs in the six-county study area covering more than 5,000 square miles.

Every region in the world faces ever-changing market conditions that challenge the potential to grow in an economically balanced manner. Each metropolitan region relies on "basic" job sectors (including industrial and agriculture sectors) to support "non-basic" job growth (such as retail and business service jobs). The basic sectors generally "create" goods for regional export—thereby generating wealth for the region.

Regional economic conditions hinge on larger national and international trends. According to regional economic forecasts by Metro, the Portland-Vancouver PMSA is poised for continued long-term economic growth that is in excess of the nation. Key findings of the economic overview include:

- A robust economy and perceived high quality of life will continue to attract new residents, thereby expanding the region's civilian labor force. According to the Bureau of Economic Analysis, between 1975 and 1996, employment growth in the PMSA exceeded national growth rates in all but three years (1980 to 1983).
- Projected gains in personal income reflect the expectation of continued prosperity. Jobs relating to industrial activity pay an average of 30 percent higher than average wage rates in the PMSA.

Industrial Demand Analysis

The demand methodology includes an innovative method to convert regional employment projections into industrial land needs. Forecasts for the PMSA over the 2000 to 2020 time period include:

- Total non-farm employment is forecasted to increase by nearly half a million jobs – to approximately 1.65 million, up from a current level of 1.15 million jobs. About 90,000 jobs are projected to require additional industrial land.
- Approximately 64.6 million square feet of additional industrial building space will be required over the next 20 years, a 35 percent increase in the PMSA's industrial building space inventory.

The forecasted increase in industrial facilities will require approximately 6,310 net buildable acres of industrial-zoned land, which is considered to be the minimum land required to accommodate forecasted industrial job growth since it does not reflect land required for roads, utilities, or public open space. For the sake of comparison, this amount of land is equivalent to about three Rivergate Industrial Districts (located in North Portland).

Industrial Supply Findings

The industrial supply findings in this study are derived primarily from available Geographic Information Systems (GIS) data, as supplemented by interviews with local jurisdictions and real estate professionals, and field checked for sites greater than 100 acres.

To assess industrial site suitability, all vacant and redevelopable industrial lands have been classified as either: Tier A (without major development constraints); Tier B (constrained by lack of public facilities, corporate ownership, soils, use constraints, brownfields, or transportation access); Tier C (infill sites smaller than one acre and "commercial valued" sites based on current property tax assessment records); or Tier D (redevelopment sites).

Important supply findings include:

- Approximately 2,387 acres (26 percent) of the net buildable supply in the PMSA is classified as Tier A-readily developable without major constraints. There is an additional 6,811 acres of supply constrained by such factors as: insufficient infrastructure (e.g., roads and utilities), ownership, size, redevelopment costs, and outlying "rural" location.
- Certain areas/jurisdictions have little or no Tier A supply, such as Clackamas County with 47 acres. Other locations, such as Clark County have over half of the Tier A inventory (1,345 acres). These sub-regional disparities can have serious jobs/housing and transportation balance implications.
- There are few remaining parcels of industrial land over 50 acres in size. Over 60 percent of the industrial land inventory is in parcels less than five acres, and 80 percent is in parcels less than 10 acres. There are only three Tier A parcels in excess of 100 acres in the PMSA.
- Given the importance of the Tier A supply in meeting industrial job growth forecasts, an analysis was conducted to determine how long it will take to use up the remaining Tier A supply. Based on current job growth forecasts, we expect the Tier A supply in the PMSA to be depleted within 7 to 9 years, and much sooner for some counties in the study area.
- Added pressure for land banking, industrial rezoning, and commercial/mixed-use development is anticipated in coming years as the Tier A industrial land supply diminishes. Hence, the effects of a limited Tier A land supply will constrain job growth well within 7 years, and much sooner in some counties.
- With recent federal listing of salmon as an endangered species, new environmental regulations will likely result in further reductions in buildable industrial land supply.
- The forecasted 20-year net buildable land demand in the PMSA (6,310 acres) is significantly greater than the Tier A industrial vacant land inventory of 2,387 acres.

Policy Considerations

A preliminary analysis of industrial trends in the Portland Metro region indicates that because of limited choices in industrial site location and parcel size, the following consequences can occur unless additional Tier A land is identified or constraints to Tiers B, C, and D lands are removed:

- Approximately one-half of the potential job growth could be "leaked" to other regions of the state and country within seven years.
- Industrial job growth will lag behind Metro forecasts by nearly 27,000 jobs over 20 years.
- Lower industrial job growth will result in reduced secondary job growth in service, retail and other sectors. Metro's baseline job growth forecasts for the Portland UGB would likely be reduced by 94,000 total jobs over 20 years.
- Lower job growth will lower potential state income tax revenues, fuel tax revenues, Tri-Met payroll tax revenues, local property tax revenues, business license tax revenues, etc. This may in turn affect state spending for education, parks and other critical programs.
- A reduction in potential industrial jobs means there will be fewer family wage jobs (paying above the median household income level) and fewer minimum wage jobs as indirect service-oriented jobs are reduced. Hence, household income levels and housing affordability will also be negatively impacted if industrial land needs are not met.

Analysis of Existing Situation

Metro code and Oregon and Washington State land use laws require regional and local governments to provide sufficient land capacity to accommodate 20 year industrial land needs. However, Metro has not historically been faced with a Tier A industrial land shortage. Historically, Metro has measured the total supply of industrial land, but has not qualified the supply's availability as the Regional Industrial Land Study has with four separate tiers.

The long-term lack of Tier A industrial lands and immediate subregional geographic disparities in the supply raise important long-range planning issues for both Oregon and Washington.

The time is ripe for state, regional and local governments to address the issue of Tier A industrial land needs and overall industrial land availability. There are generally two main policy options to consider:

- Removing the development constraints to Tier B, C and D lands (requires public investment in roads, utilities); and
- Adding Tier A land into the industrial supply from other land resources (can be accomplished during Metro's Urban Growth Boundary periodic review process).

Removing Industrial Development Constraints

Potential means to remove industrial development constraints and to preserve the existing Tier A land supply include:

- Targeted public infrastructure investment, such as roads and utilities.
- Industrial land banking initiatives.
- Local tax incentives such as allowing property tax abatement for industrial redevelopment projects and the elimination of farm tax deferral in selected locations.
- Government loans and grant programs that can be used for industrial building/site environmental remediation and seismic upgrade improvements.
- Public/private partnerships to proactively master plan real estate holdings for future internal expansion and/or "external" development through appropriate plan review and partitioning processes.
- Creating model development code ordinances that assist local jurisdictions in preserving adequate industrial lands for future economic growth, while limiting commercial or residential intrusion.

Adding Land to the Tier A Industrial Supply

Another means of addressing the industrial land shortage is to add Tier A industrial lands to the study area. This can be accomplished as lands (i.e., urban reserves) are brought into Oregon Urban Growth Boundaries (UGBs) and Clark County Urban Growth Areas (UGAs).

Given the relative low land value of industrial development compared to residential and commercial development, and the need to find suitable sites with flat topography and good transportation access, appropriate locations for future industrial development need to be carefully selected.

Recommended Next Steps

This industrial land needs study contains new information to consider when establishing long-term land use policies that determine how the Portland-Vancouver PMSA will enhance and diversify its economic base. Given the limited existing Tier A industrial land supply and its effect on near and long term economic potential, the following recommendations are intended to help guide future public actions:

- Continue regional public and private-sector dialog to raise awareness of industrial need. The region, including governments, the private sector, and interested citizens, should continue to work together to monitor the dynamics of industrial supply and demand in the PMSA.
- Closely monitor industrial land supply—the effects of emerging environmental resource areas will likely have a major impact on the available industrial land supply. It is recommended that the buildable industrial lands maps referenced in this study be

incorporated into the Metro RLIS and Clark County GIS databases (available to the public) and be regularly updated.

- Determine how much the Portland-Vancouver PMSA can rely on Tier B, C, and D lands to meet job growth requirements — this entails a more detailed analysis of industrial user requirements for specific sectors such as warehousing/distribution, and high technology sectors.
- Conduct a cost-benefit analysis to determine where potential public investment results in the greatest potential for removing Tier B, C, and D development constraints.
- Consider public policies that help retain or increase the available Tier A unconstrained industrial land supply such as:
  - Targeting a rolling 5 to 10-year supply of vacant Tier A lands;
  - Designating urban reserves for future industrial development;
  - Promoting local land use code amendments that preserve land for industrial development;
  - Reducing or eliminating farm tax deferral obligations for newly recorded industrial plats; and
  - Other public and private actions as outlined above.

The next phase of this effort should focus on addressing the recommended next steps and creating an Industrial Lands Strategy for the PMSA. This strategy would facilitate land use and transportation planning and implementation actions that lead towards continued economic opportunity for all residents within the Portland-Vancouver PMSA.

Chapter 1 — Introduction

Purpose of the Study

This study was developed to assist local, regional and state governments, public and private real estate interests, and interested citizens in understanding industrial land requirements in the Greater Portland-Vancouver PMSA. The intent of this study is to:

- Identify 20-year industrial land needs based on regional job growth forecasts and market trends;
- Provide a good up-to-date industrial lands inventory using a newly developed Geographic Information System (GIS) land classification system;
- Consider the effects of development constraints, such as parcel size and environmental issues, on land absorption and our region's ability to meet job growth forecasts.
- Determine if there are any significant discrepancies in the availability of buildable industrial lands to accommodate expected job growth.

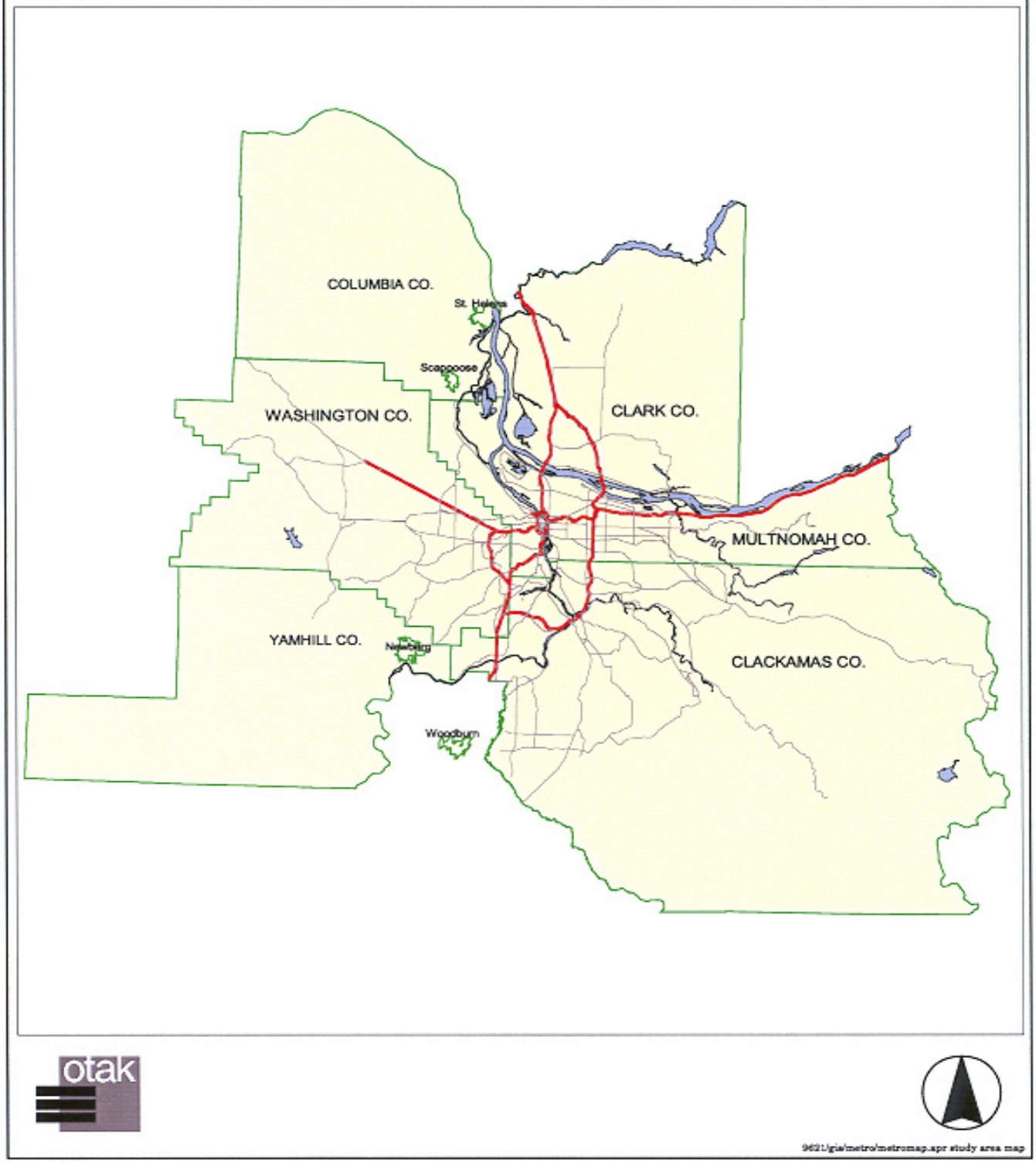
This study is intended to shed light on the adequacy of our regional industrial land supply, and the relationship between industrial lands and job creation. Policy issues and considerations are not part of this study, but will be the subject of a follow-up Phase III project effort.

Study Region

The Regional Industrial Land Study focuses on the six-county Portland-Vancouver Metropolitan Statistical Area (PMSA), as displayed in Figure 1. The counties included are Clackamas, Multnomah, Washington, Columbia and Yamhill in Oregon; and Clark County, Washington. This six-county study area was chosen since it is consistent with the U.S. Census PMSA definition and generally conforms with our regional market area for labor and industry.

Regional Industrial Land Study Area

Figure 1



Study Process

Several "partners" from Oregon and Washington have jointly agreed to conduct an Industrial Lands Strategy that is composed of three phases, as indicated in Figure 2.

Phase 1 Industrial Lands Focus Groups — included focus group discussions with diverse real estate, land use, environmental, and agricultural interests. Phase 1 was completed in July 1998 and served to identify the various perspectives on industrial development and to inform the scope of work for Phase 2.

Phase 2 Regional Industrial Land Study (this effort) — was initiated in November 1998, and is to be completed by July 1999. This study phase is intended to result in a detailed foundation of industrial land supply and demand findings. Phase 2 included close coordination with a Technical Advisory Committee (TAC) made up of study partners. Public input was solicited at two workshops in Portland and Vancouver during this phase.

Phase 3 Regional Industrial Strategy — will soon be initiated and extend into Fall 1999. Phase 3 recommendations will take into account the results of prior work phases to determine what specific policy refinements may be needed at state, regional, and local government levels.

Study Partners and Sponsors

Sponsors — This study was jointly funded by the following agencies:

- Governor's Community Response Funds
- Metro (Multnomah/Washington County) Regional Strategies Board
- Mount Hood Economic Alliance
- Northwest Natural Gas
- Oregon State Lottery Funds
- PacifiCorp
- Portland General Electric
- Port of Portland
- Portland Development Commission
- Commercial Real Estate Economic Coalition

Partners — In addition to these sponsors, the following agencies provided valuable management and technical oversight, and agreed on the study goals, objectives, and overall work program/methodology.

- Clackamas County — Renate Mengelberg
- Columbia River Economic Development Council — Pamela Neal
- Commercial Real Estate Economic Coalition — Rick Williams and Wally Hobson
- Metropolitan Service District (Metro) — Dennis Yee
- Oregon Economic Development Department — Marcy Jacobs
- Port of Portland — Mary Gibson, Scott Drumm and Justin Bates
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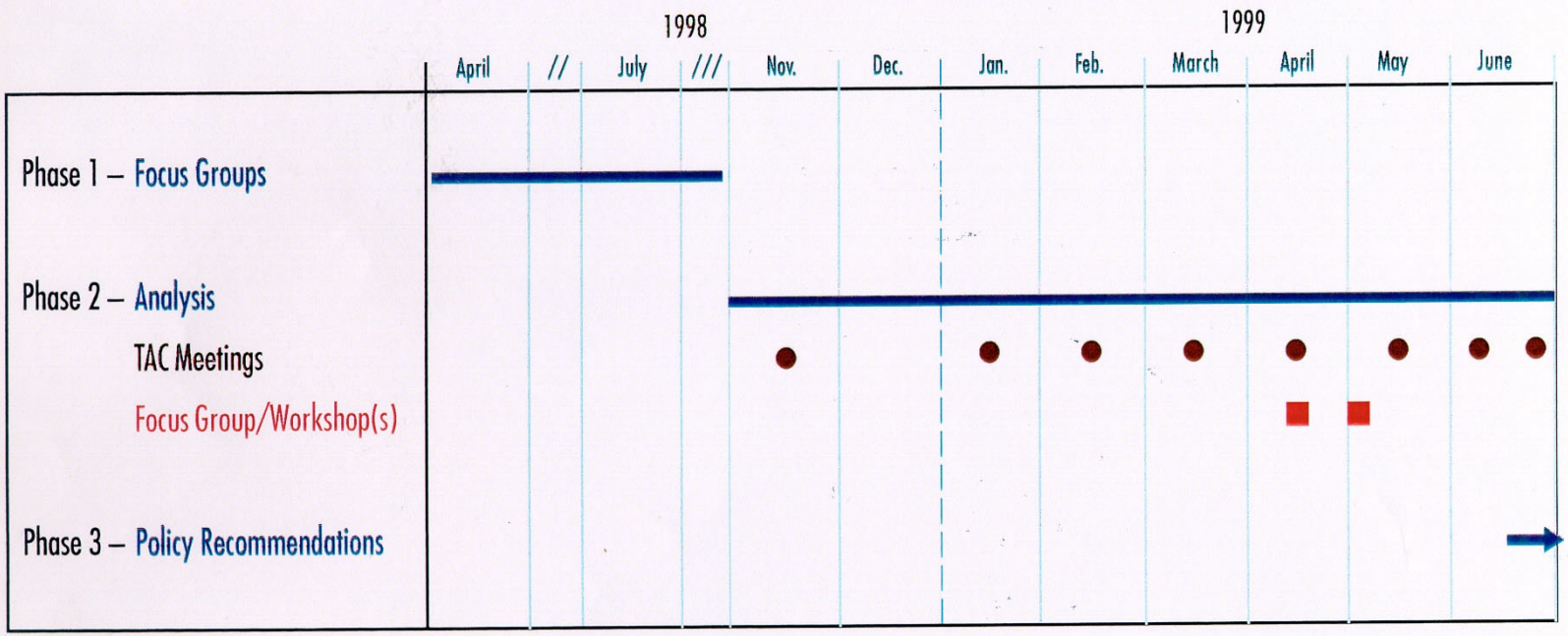
Portland Regional Industrial Land Study

Study Process

Figure 2



Report Organization

This report is organized into and executive summary and six main chapters:

Executive Summary — describes overall study findings and conclusions.

Chapter 1, Introduction — with an overview of report purpose, study area, plan process, and agency partners.

Chapter 2, Economic Overview — describes fundamental regional trends and projections for employment, population and other factors influencing industrial land demand.

Chapter 3, Industrial Demand — includes a detailed analysis of how regional job growth forecasts translate into industrial building types and land requirements.

Chapter 4, Industrial Supply — evaluates and displays the buildable industrial lands, and describes how the supply was calculated.

Chapter 5, Conclusions — compares demand with supply to make general conclusions regarding industrial land needs.

Chapter 6, Policy Considerations and Next Steps — lists important issues for policy discussion in the near future.

Chapter 2 — Economic Overview

The Big Picture

The Portland-Vancouver Primary Metropolitan Statistical Area (PMSA) includes six counties. The PMSA consists of Clackamas, Columbia, Multnomah, Washington, and Yamhill counties in Oregon; and Clark County, Washington. Portland, the core city of the PMSA, lies in Multnomah County. The Portland-Vancouver PMSA has led Oregon's economic growth over the past decade. Between 1990 and 1998, employment in the Portland-Vancouver PMSA expanded by nearly 25 percent. This represents nearly a quarter of a million jobs, and a 3.2 percent annual gain in employment. During this same period, employment across Oregon grew by 16 percent, with an average annual growth rate of 2.1 percent.

Over the past 20 years, the economy of the PMSA has shifted from its traditional natural resource base of lumber and wood products toward greater reliance on high technology, metals manufacturing, professional services, and international trade. Lumber and wood products industries experienced a temporary respite in the late 1980s from Oregon's recession earlier in the decade, and have remained flat since then in spite of statewide economic expansion.

In recent years, machinery, electronics and electronic equipment have led job growth in the manufacturing sector. Leading employment sectors in non-manufacturing have been construction; retail trade, especially eating and drinking establishments; and health and business services. Temporary help and software/data processing services have been among the most rapidly growing business service segments.

In large part, Portland's growth over the past decade reflects expansion across the entire Pacific Northwest. Strong trade ties with Asia and an expanding high-technology sector caused the regional economy to grow more rapidly than the national average during much of the mid and late 1990s. However, recent downturns in Asian economies, and in the high-tech and aerospace sectors, have slowed growth in the Portland-Vancouver PMSA.

Because Asia accounts for most of the international trade moving through the state, Oregon's economy is especially vulnerable to Asian economic conditions. According to the US Department of Commerce, nearly 80 percent of Oregon's waterborne and air cargo trade by tonnage, and 90 percent by value, is with Asian Pacific Rim nations.[1] The impact of the Asian economic crisis on Oregon is evidenced by a 21 percent decrease in the value of Oregon's exports to Asia between 1995 and 1997, from $8.7 billion to $6.9 billion. This

[1] According to the US Department of Commerce, Japan accounts for the majority of Oregon's international trade – comprising approximately 60 percent of all Asian exports and imports. Oregon's other major Pacific Rim trading partners are Korea, Taiwan, China/Hong Kong and the Association of Southeast Asian Nations (ASEAN), which consists of Indonesia, Malaysia, Philippines, Singapore, and Thailand.

contraction led to an overall 17 percent decline in Oregon's export values during the same period, from $10.2 to $8.4 billion.

The long-term economic outlook for the Pacific Northwest remains optimistic. Standard & Poor's/Data Resources Incorporated projects near-term regional growth of 2.3 percent annually through the year 2003. Although this growth is more moderate than that of recent years, it is on par with the national average.

The outlook for the Portland-Vancouver PMSA is for continued but tempered growth as international market turbulence impacts local companies. Attractive "quality of life" factors combined with competitive energy costs and abundant natural resources will support long-term market growth. The area is expected to continue focusing its economic development efforts on the high technology, metals, biotechnology, and health science industries.

Population

Metro (the Portland area's planning organization) estimates that 1.8 million people lived in the Portland-Vancouver PMSA in 1998. Over half of these residents lived in Multnomah and Washington Counties. Another 40 percent lived in Clackamas and Clark, with less than 10 percent living in Yamhill and Columbia Counties. Table 1 shows population trends across PMSA counties. Current patterns of population distribution are not expected to change significantly during the next 20 years. (Note: Tables in this section generally show data for 1990, 1998 and 2020. Appendix tables show data at five-year intervals from 1990 through 2025.)

Population growth in the Portland-Vancouver PMSA has gone through several phases over the past 30 years. During the 1970s, the area's population grew by an average of 2.1 percent a year. Feeling the effects of the recession of the early 1980s, population growth slowed to an average of 1.3 percent annually during that decade. Since 1990, the PMSA's population has increased at an average rate of 2.3 percent a year. Although some of this growth has been due to natural increase (i.e., the number of annual births exceeding the number of annual deaths), the dominant force has been migration inflows to the region. Recently, population increases appear to be leveling as the economies of neighboring states including California, Nevada, and Idaho prosper.

Table 1: Population Growth in the Portland-Vancouver PMSA

				Annual Growth Rate	
	1990	**1998**	**2020**	**1990-1998**	**1998-2020**
Clackamas County	278,850	324,620	439,760	1.9%	1.4%
Clark County	238,050	320,060	514,540	3.8%	2.2%
Columbia County	37,560	40,860	47,100	1.1%	0.6%
Multnomah County	583,890	648,460	758,450	1.3%	0.7%
Washington County	311,550	399,130	609,970	3.1%	1.9%
Yamhill County	65,550	80,950	117,700	2.7%	1.7%
Total	**1,515,450**	**1,814,100**	**2,487,520**	**2.3%**	**1.4%**

Source: Metro Data Resource Center

Across the PMSA, counties surrounding the city of Portland have experienced the greatest growth during the 1990s. Clark and Washington Counties have grown most rapidly, followed by Yamhill, whose growth has been fueled by high-tech industrial expansion in neighboring Washington County. Because it is the most heavily populated county in Oregon, Multnomah County has one of the slowest growth rates in the PMSA. Nonetheless, Multnomah's relatively low growth rate represents over 64,500 people, or 20 percent of regional population growth between 1990 and 1998. Columbia County was impacted by declining forest products employment and closure of the Trojan nuclear power plant in the mid-1990s, and has been the slowest growing county in the PMSA.

Portland's robust economy and perceived high quality of life will continue to attract migrants, albeit at a slower rate. Between 1998 and 2020, Metro projects that the population of the Portland-Vancouver PMSA will expand by 1.4 percent a year, to a total of 2,487,520.

Income and Sectoral Earnings

Increases in regional income over the past decade highlight the PMSA's healthy economic climate. Projected gains in personal income and sectoral earnings reflect the expectation of continued prosperity. According to Metro, per capita income across the PMSA grew by an average of 2.0 percent annually between 1990 and 1998. Within the region, income gains have been highest in Clackamas and Columbia, and lowest in Clark and Yamhill Counties. Table 2 shows that comparative levels of per capita income earnings among PMSA counties are expected to remain relatively stable into the future.

Table 2: Per Capita Income in the Portland-Vancouver PMSA (constant 1998 dollars)

				Annual Growth Rate	
	1990	1998	2020	1990-1998	1998-2020
Clackamas County	$24,723	$31,068	$38,430	2.9%	1.0%
Clark County	$22,503	$25,289	$28,814	1.5%	0.6%
Columbia County	$19,579	$23,359	$27,913	2.2%	0.8%
Multnomah County	$24,572	$28,271	$31,519	1.8%	0.5%
Washington County	$25,162	$29,438	$34,732	2.0%	0.8%
Yamhill County	$19,360	$21,498	$24,052	1.3%	0.5%
Total	**$24,048**	**$28,090**	**$32,550**	**2.0%**	**0.7%**

Source: Metro, Hammer Siler George Associates

Table 3 shows the importance of Portland's industrial base to the regional economy. Consistent with national trends, jobs relating to industrial activity are among the highest paying in the PMSA. On average, remuneration is highest in the manufacturing; transportation, communication and utilities (TCU); and wholesale trade sectors. Although the growth of past and projected earnings in the finance, insurance and real estate (FIRE) and services sectors exceeds that of industrial sectors, average wages in these sectors remain lower than industrial jobs.

Table 3: Sectoral Earnings Per Job in the Portland-Vancouver PMSA (constant 1998 dollars)

	Earnings per Job			Annual Growth Rate	
	1990	2000	2020	1990-2000	2000-2020
Construction/Mining	$37,049	$37,740	$41,395	0.2%	0.5%
Manufacturing	$40,321	$44,251	$51,335	0.9%	0.7%
TCU[1]	$41,159	$43,587	$48,987	0.6%	0.6%
Wholesale Trade	$39,343	$41,714	$47,658	0.6%	0.7%
Retail Trade	$18,551	$19,033	$20,381	0.3%	0.3%
FIRE [2]	$23,790	$30,678	$39,668	2.6%	1.3%
Services	$26,418	$29,340	$35,094	1.1%	0.9%
Government	$31,475	$35,330	$41,012	1.2%	0.7%
All Non-farm Employment	**$29,732**	**$32,201**	**$37,034**	**0.8%**	**0.7%**

[1] Transportation, Communication, & Public Utilities

[2] Finance, Insurance, & Real Estate Services

Source: Regional Economic Information System (REIS) 1969-1997, Bureau of Economic Analysis.

Employment

According to the Oregon Employment Department, Portland's economic expansion lowered the PMSA's unemployment rate from 5.1 percent in 1990 to 4.3 percent in 1997. Between 1990 and 1998, non-farm employment in the PMSA increased at an average annual rate of 3.1 percent. Metro projects that this growth will slow to an average rate of 1.6 percent a year between 1998 and 2020.

Metro provided to this study county-level mid-range economic projections including employment, income and population. Employment projections were by industry sector (one-digit Standard Industrial Classification) for the six counties that make up the Portland-Vancouver PMSA (Multnomah, Clackamas, Washington, Columbia, Yamhill, and Clark counties). The regional economic forecast is based on assumptions of moderate economic and demographic growth trends. For purposes of this study, additional industrial employment data from County Business Patterns (U.S. Census) reports were used to disaggregate the industry projections into finer detail and then re-tabulated to form broader industrial classifications specific to the parameters defined in this study. These aggregated employment projections were arrayed in five-year intervals between 2000 to 2025.

Metro's economic forecasts are derived from an econometric model that combines aspects of an export-based regional econometric model with characteristics of a regionalized input-output model. Assumptions and forecast model inputs are based on government, academic and professional forecast services sources.

This forecast is an updated version of the official economic forecast currently being used in Metro's Urban Growth Report (UGR). As such, the forecast for this study differs from Metro's official economic forecast, but not in any statistically significant fashion. In the course of this study, Metro staff adjusted the regional economic forecasts to reflect updated historical data provided by federal and state sources. It was deemed appropriate to use the unofficial forecast to calibrate for differences between recent historical occurrences and forecast deviations that occurred in 1998 (including the effects of the Asian economic crisis) and during the last four years. The forecast differences are deemed not to be material, although the use by this study of the unofficial forecast series yield somewhat lower land need results (about 500 net acres over 20 years) than what would have been calculated if the official economic forecast was used.

The UGR documents the technical findings for Metro's five-year periodic review required under Oregon State Law. In order to be consistent with other proceedings and transportation planning requirements, Metro's land use planning is necessarily based on the long-range demand projections prepared in 1995 for the forecast period of 1995-2020 (refer to Metro's 2020 Regional Forecast).

Job Growth Trends

The Portland-Vancouver PMSA is generally considered as a single labor market area; however employment trends can vary considerably between counties. Since 1990, job growth has been the strongest in Washington, Clark and Clackamas Counties (see Table 4).

These counties are expected to continue to attract increasing numbers of new jobs. Despite the national trend in job growth away from the core of PMSAs, it is likely that Multnomah County will continue to support the greatest number jobs in the PMSA.

Table 4: Non-Farm Employment by County, Portland-Vancouver PMSA

	Employment			Distribution		
	1990	**1998**	**2020**	**1990**	**1998**	**2020**
Clackamas County	123,143	167,547	273,370	13.8%	14.6%	16.6%
Clark County	104,890	148,828	265,300	11.7%	12.9%	16.1%
Columbia County	12,430	14,010	19,600	1.4%	1.2%	1.2%
Multnomah County	453,480	528,354	636,630	50.7%	45.9%	38.6%
Washington County	174,391	255,849	400,210	19.5%	22.3%	24.3%
Yamhill County	26,590	35,510	52,290	3.0%	3.1%	3.2%
Total	**894,924**	**1,150,098**	**1,647,400**	**100%**	**100%**	**100%**

Source: Metro Data Resource Center

Portland's economic expansion has been accompanied by booming residential and industrial real estate markets. Across the PMSA, the construction sector expanded at an average annual rate of 5.4 percent between 1990 and 1998[2]. This is shown in Table 5. Moderating growth and the recent completion of several major projects, including the west-side light rail extension, are likely to soften the demand for construction workers. However, Metro anticipates that continued strength in industrial and commercial markets will generate a 1.4 percent average annual growth rate in construction-related jobs between 1998 and 2020.

Table 5: Non-Farm Employment by Sector, Portland-Vancouver PMSA

	Employment			Annual Growth Rate	
	1990	**1998**	**2020**	**1990-1998**	**1998-2020**
Construction/Mining	50,176	76,559	102,980	5.4%	1.4%
Manufacturing	130,893	150,225	190,665	1.7%	1.1%
TCU [1]	47,502	61,718	80,537	3.3%	1.2%
Wholesale Trade	61,183	80,097	101,948	3.4%	1.1%
Retail Trade	150,254	188,677	268,862	2.9%	1.6%
FIRE [2]	72,063	88,846	127,151	2.7%	1.6%
Services	263,906	366,729	601,074	4.2%	2.3%
Government/Other	118,947	137,248	174,187	1.8%	1.1%
Total Employment	**894,924**	**1,150,098**	**1,647,403**	**3.2%**	**1.6%**

[1] Transportation, Communication, & Public Utilities

[2] Finance, Insurance, & Real Estate Services

Source: Metro Data Resource Center

[2] This measure of growth includes a small amount of mining activity that occurs within the six county PMSA.

The services sector followed construction as Portland's second fasting growing sector between 1990 and 1998, expanding at an average rate of 4.2 percent annually. The broadly-defined services sector is the greatest source of jobs in the PMSA, employing nearly one-third of all regional workers in 1998. Major regional employers in the services sector include health services such as Oregon Health Sciences University. As in-migration and population growth in the Portland area subside, Metro projects that annual growth in the services sector will moderate to an average rate of 2.3 percent annually between 1998 and 2020.

Regional wholesale and retail trade expanded at the annual rates of 3.4 and 2.9 percent, respectively, between 1990 and 1998. Wholesale and retail trade accounted for nearly one-quarter of all regional jobs in 1998. Retail activities comprised over 70 percent of this employment. Although most wholesale employment is found in Multnomah and Washington Counties, its growth has been highest in Clackamas County. Across the PMSA, Clackamas has the largest proportion of trade related jobs — nearly 30 percent of county-wide employment. Metro projects that Portland's tempering population growth will moderate expansion of the wholesale and retail trade sectors to 1.1 and 1.6 percent a year, respectively, between 1998 and 2020.

Bucking the national trend, manufacturing employment in the PMSA has grown over the past decade. Between 1990 and 1998, regional manufacturing jobs expanded by 1.7 percent annually. Approximately two-thirds of the region's manufacturing employment is in durable goods. Over 40 percent of these jobs are in high-tech industries, which include computer and office machinery, electronic equipment, instruments and related products. In 1998, manufacturing accounted for over 13 percent of all PMSA jobs. Manufacturing employment is highest in Washington County, which is home to over half of Oregon's high-tech employment opportunities. Metro projects that growth in regional manufacturing employment will slow to an average of 1.1 percent a year between 1998 and 2020.

Employment in the transportation, communication and utilities (TCU) sector grew by an average of 3.3 percent annually between 1990 and 1998. Most regional jobs within the TCU sector are in the trucking and warehousing, communication, and electric service industries. The TCU sector accounts for a small share of all regional jobs – only about 5 percent in 1998. Most of these jobs are located in Multnomah County, which hosts Portland International Airport, marine ports, and headquarters of major utilities. Deregulation and consolidation are likely to constrain future growth in the utilities portion of this sector, and Metro projects that sectoral employment will grow by 1.2 percent between 1998 and 2020.

Employment in the finance, insurance and real estate (FIRE) sector grew 2.7 percent annually between 1990 and 1998. Jobs in this sector are concentrated in the central PMSA; nearly three-quarters of all regional FIRE jobs are located in Multnomah and Washington Counties. The long-term employment trend in this sector is likely to be restrained by the region's moderating economy, continued bank mergers, and the expansion of electronic banking services. Metro projects that FIRE employment will grow at an average rate of 1.6 percent a year between 1998 and 2020.

Employment in the government sector, which includes federal, state and local government employees, increased by 1.8 percent annually between 1990 and 1998. Over this time, reductions in federal employment were offset by increases in state and local payrolls.

Commensurate with national trends, growth in state and local government employment is projected to continue leading growth within the Portland area's government sector. Metro projects that, overall, growth in government employment will moderate to 1.1 percent annually between 1998 and 2020.

Regional Industrial Real Estate Performance

Portland's industrial real estate market has been strong in recent years. Industrial space data presented in this section pertains to the urbanized Portland area in the four counties of Clackamas, Clark, Multnomah, and Washington. Hereinafter, this area is referred to as the "greater Portland area." According to industrial property inventories measured by the commercial real estate group of CB/Richard Ellis, industrial space across the greater Portland area increased by approximately 23 percent between 1990 and 1998. This represents an average gain of about 3.75 million square feet of space a year. Table 6 highlights the significant inventory increases that occurred during the mid-1990s. Because industrial vacancy rates have remained relatively stable over this period, new construction can be viewed as a proxy of annual industrial absorption in the region.

Table 6: Industrial Space Construction and Inventory
Greater Portland Area 1991 – 1998

	Square Feet of Building Space		
	Construction	**Inventory [1]**	**% Change Over Prior Year**
1990		133,558,528	—
1991	1,654,000	135,212,528	1.2%
1992	1,283,000	136,495,528	0.9%
1993	681,000	137,176,528	0.5%
1994	2,422,468	139,598,996	1.8%
1995	6,155,783	145,754,779	4.4%
1996	6,809,588	152,564,367	4.7%
1997	6,250,299	158,814,666	4.1%
1998	4,828,470	163,643,136	3.0%

[1] Limited to buildings over 10,000 square feet

Source: CB/Richard Ellis

Portland's industrial vacancy rate is among the lowest in the country. CB/Richard Ellis and Cushman-Wakefield estimated a 6.5 percent industrial vacancy rate at the close of 1998. By comparison, Grubb & Ellis estimated a year-end 1998 industrial vacancy rate of 8.4 percent, and Norris Beggs & Simpson estimated an 8.6 industrial vacancy rate. The differences in vacancy rates are largely due to the latter two estimates' consideration of a more limited

segment of industrial properties; such as industrial and business parks only, and tenant occupied properties (owner space tends to have lower vacancy rates).

CB/Richard Ellis provides the most comprehensive estimate of the PMSA's industrial property. It covers all buildings over 10,000 square feet and includes owner-occupied space. Their year-end 1998 estimate contains nearly 164 million square feet of industrial space, and more than 3,000 industrial buildings. Based on Regional Land Information System (RLIS) data on parcel size, an additional 37 million square feet of space in buildings under 10,000 square feet is estimated to exist in the greater Portland area. Table 7 shows the distribution and availability of the CB/Richard Ellis inventory.

At the end of 1998, the southwest sector (as illustrated in Figure 3) had the largest, and one of the tightest, industrial markets in the region. Vancouver, which contains the smallest amount of industrial space, had the lowest vacancy rate. The highest industrial vacancy rates were found in the northeast and southeast submarkets. These subareas, as designated by CB/Richard Ellis, generally follow county boundaries, with the exception that the western portion of Clackamas County is combined with Washington County to form the southwest sector. The southeast submarket consists of the remainder of Clackamas County. Combined, the northwest and northeast submarkets encompass Multnomah County. Portland's industrial submarkets are identified on Figure 3.

Table 7: Industrial Space Inventory, Greater Portland Area Year-End 1998

	Square Feet	Percent	Vacancy Rate
Northeast	29,835,000	18%	9.6%
Northwest	38,149,000	23%	5.5%
Southeast	26,798,000	16%	8.1%
Southwest	51,361,000	31%	5.4%
Vancouver	17,500,000	11%	4.7%
Total	**163,643,000**	**100%**	**6.5%**

Source: CB/Richard Ellis

Across the PMSA, industrial space is divided fairly equally between owner-occupied and leased space (see Table 8). The northwest and southwest submarkets contain the largest proportions of owner-occupied space, while Vancouver contains the largest proportion of leasable space.

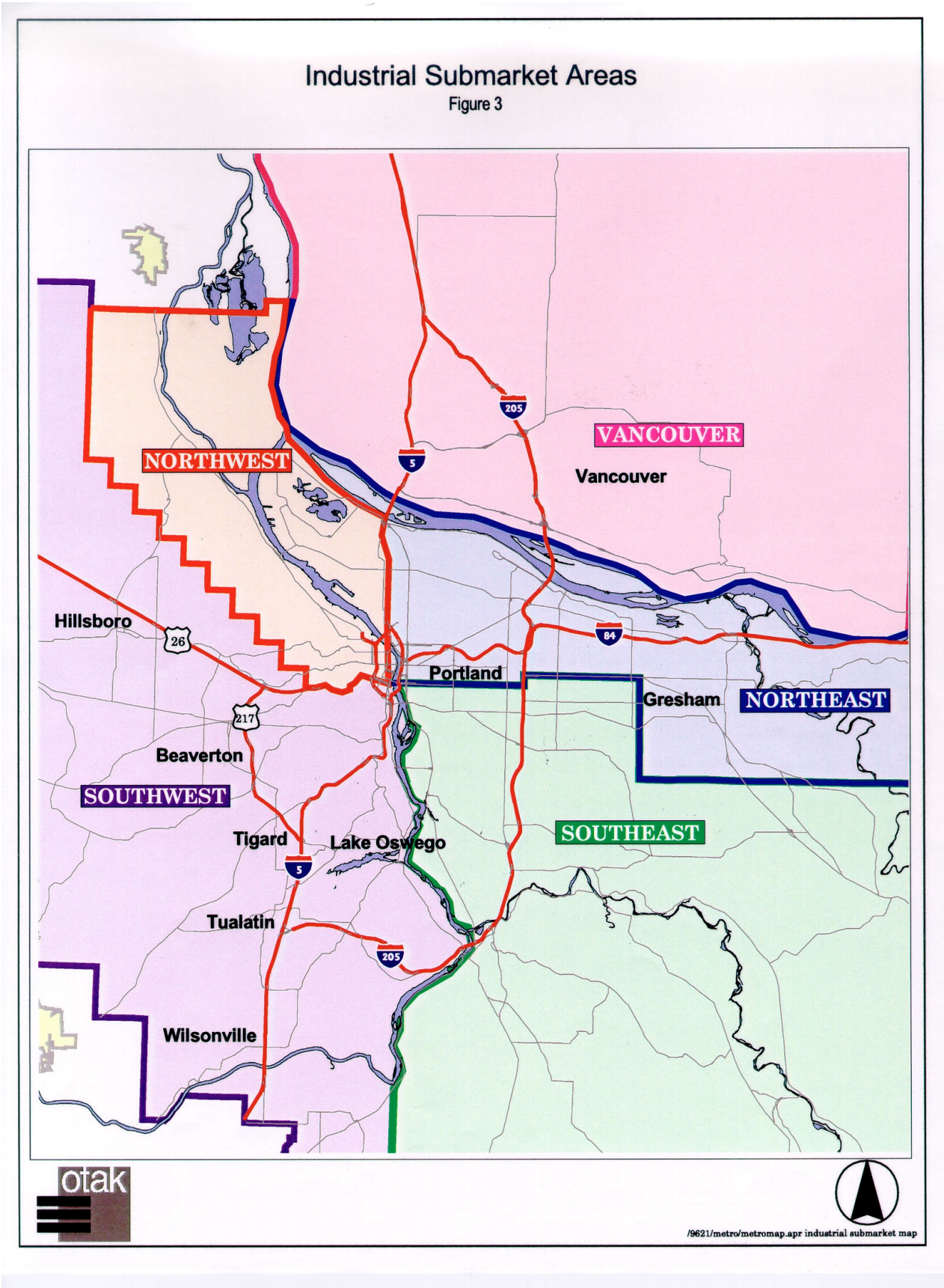

Industrial Submarket Areas
Figure 3
NORTHWEST
VANCOUVER
Vancouver
Hillsboro
Portland
Gresham
NORTHEAST
Beaverton
SOUTHWEST
Tigard
Lake Oswego
SOUTHEAST
Tualatin
Wilsonville
205
5
26
84
217
otak
/9621/metro/metromap.apr industrial submarket map

Table 8: Industrial Space by Occupancy Type, Year-End 1998
Greater Portland Area

	Square Feet of Building Space		Distribution of Building Space	
	Owner Occupied	**Leased**	**Owner Occupied**	**Leased**
Northeast	14,653,000	15,182,000	18%	19%
Northwest	20,324,000	17,825,000	25%	22%
Southeast	13,221,000	13,577,000	16%	17%
Southwest	26,968,000	24,393,000	33%	30%
Vancouver	7,160,000	10,341,000	8%	12%
Total	**82,325,000**	**81,318,000**	**100%**	**100%**

Source: CB/Richard Ellis

Distribution/warehouse space comprises 65 percent of all industrial space in the greater Portland area. Table 9 summarizes the distribution of industrial space across the region in three categories: warehouse/distribution, general industrial and high tech/flex. This measure of space includes CB/Richard Ellis' estimates of flex, incubator, and high-tech space, the latter of which includes computer chip manufacturing.

Nearly one-quarter of all distribution/warehouse space is located in the northwest submarket. Industrial markets in the northeast and southeast submarkets are also heavily characterized by distribution/warehouse space. Of all the submarkets, Vancouver currently contains the least amount of distribution/warehouse space in the greater Portland area.

Tech/flex space accounts for 22 percent of the region's inventory of industrial space, and is now the fastest growing building type in the region. Reflecting the prevalence of high-tech activity in Washington County, nearly two-thirds of all flex space is located in the southwest submarket. The northwest and southeast industrial submarkets have the lowest concentrations of flex space, and, combined, contain less than 10 percent of all flex space in the greater Portland area.

General manufacturing space makes up 14 percent of the region's industrial space. Nearly half of all manufacturing space is located in the northwest and Vancouver submarkets. The remaining half is distributed fairly equally between the remaining three geographic submarkets. Despite the relatively small size of the Vancouver industrial market, it contains the highest concentration of manufacturing space in the greater Portland area.

Table 9: Industrial Space by Geographic Submarket, Year-End 1998
Greater Portland Area

	Total	Distribution/ Warehouse	General Industrial	Tech/ Flex
Northeast	29,835,000	21,779,000	3,729,000	4,326,000
Northwest	38,149,000	31,878,000	5,657,000	614,000
Southeast	26,798,000	20,666,000	4,145,000	1,987,000
Southwest	51,361,000	24,207,000	3,691,000	23,462,000
Vancouver	17,500,000	7,547,000	5,135,000	4,818,000
Total	**163,643,000**	**106,077,000**	**22,358,000**	**35,208,000**
Building Type Distribution	**100.0%**	**64.8%**	**13.7%**	**21.5%**

Source: CB/Richard Ellis

CB/Richard Ellis estimates that, at the end of 1998 approximately 1.75 million square feet of industrial construction was underway in the greater Portland area. Nearly 60 percent of this activity was in the southwest submarket. Another 36 percent was under construction in the northeast submarket, with the remaining 5 percent of new construction located in the Vancouver area.

Due to the vast amount of construction delivered since 1995, a lull in new warehouse construction is anticipated through the year 2000. The flex market is expected to remain relatively stable in the near-term, although it is likely to feel the effects of an overbuilt suburban office market Many high-tech companies such as Tektronix, Hewlett Packard, and Fujitsu have recently consolidated or vacated some of their real estate assets, which will add to the near-term availability of tech/flex space.

Over the long term, industrial building vacancy rates will hover at 5 to 6 percent and expanding job growth will require additional construction of all building types.

Chapter 3 — Industrial Demand

Methodology

This chapter describes the methodology used to forecast the demand for industrial land in the Portland-Vancouver PMSA between 2000 and 2020. The overall objective of the methodology was to convert regional employment projections into industrial land needs. The process through which this objective was achieved is outlined in Figure 4 and discussed in greater detail within this section. Essentially, the demand analysis followed a four-step procedure:

- Estimating the growth in the number of industrial workers in the Portland-Vancouver PMSA.
- Distributing industrial workers to industrial building types.
- Estimating the number of building square feet per employee required by each building type.
- Projecting the additional acres of land required to accommodate future industrial employment.

A sensitivity analysis was also conducted on the impact of changes in several key variables on projected industrial land needs over the planning period.

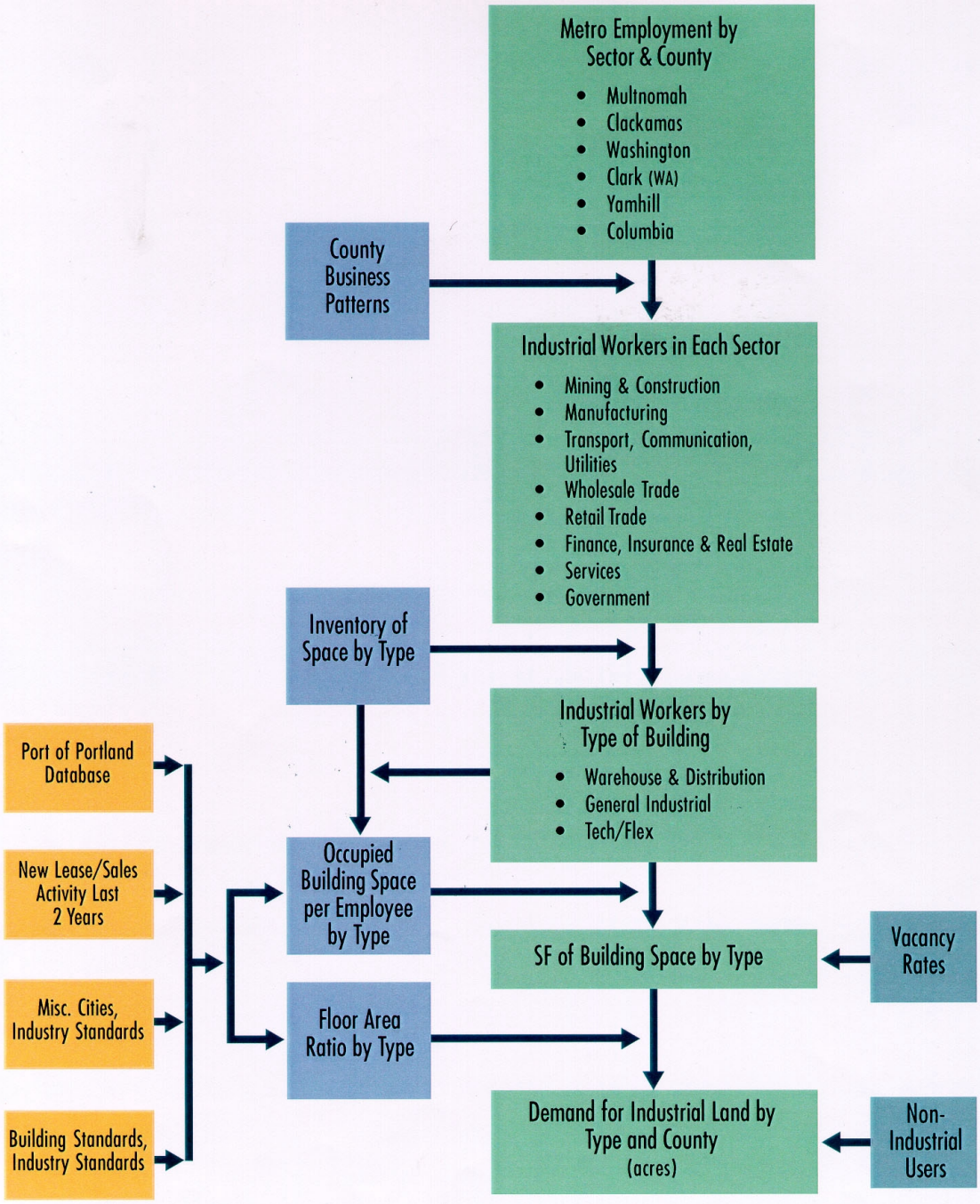
Because the supply analysis accommodates current construction and committed sites, the demand analysis focuses on land needs after 2000. An end period of 2025 was selected to allow for flexibility in addressing the 20-year planning horizon called for in the State of Oregon land use statutes. The analysis described herein is based on Metro's experimental, mid-range population and employment forecasts, as described in the prior section. Actual growth rates above or below Metro's mid-range forecasts would influence the year in which a given level of growth would be achieved. Therefore, projecting long-term industrial employment provides the flexibility to interpret the resultant land needs in light of alternative growth scenarios. To maintain consistency with established planning horizons, the summary tables in this section show projections through 2020. Detailed appendix tables show all data in five-year intervals through 2025.

Industrial Job Forecasts

County-level employment data used in the demand analysis were provided by the Metro Data Resource Center. Metro's employment forecasts are discussed in the overview section of this report, and underlie the detailed demand analysis presented here. For purposes of the current study, employment projections by sector (essentially one-digit SIC categories) for the six counties in the Portland-Vancouver PMSA were summed to project total employment in the Portland-Vancouver PMSA for five year intervals between 2000 and 2025.

Industrial Demand Analysis Methodology

Figure 4



Historically, firms in the construction; manufacturing; transportation, communication and utilities (TCU); and wholesale sectors have occupied industrial land. However, the nature of economic activity at the end of the twentieth century argues against strictly applying past conditions to current trends. Increasingly, sectors not traditionally thought of as industrial occupy industrial land. According to the study's findings, industries such as software, data services, and programming account for about 20 percent of the industrial jobs in the Portland-Vancouver PMSA.

Most, but not all, high-tech employment is included in the manufacturing sector. Fast growing industries such as research, computer software and data processing services are part of the services sector and are often located in commercial office or industrial flex space. Other services sector activities, such as auto and miscellaneous repair services, also occur on industrial land. On the other hand, not all "industrial" workers work on industrial land. For instance, some communication and utility sector employees work in corporate offices that are located in commercial areas; while others are engaged in installation, repair, and sales activities that are not tied to a specific site. Similarly, a large portion of the construction workforce is employed outside industrial areas.

The sectors that constitute the primary demand for industrial land are shown in Table 10. The table also shows the percentage of each sector's employment that was determined to occupy industrial space. This determination was based on judgments concerning the type of employment for detailed sectors (four-digit SIC categories, when available) within broader sectors. This assignment of sectoral workers to an "industrial" category became the basis for projecting industrial employment levels within counties in the region.

Table 10: Industrial Workers by Employment Sector
Portland-Vancouver PMSA

Sector	SIC Code	Industrial
Mining	10-14	100%
Construction	15-17	25%
Manufacturing	20-39	100% *
Transportation, Communication, & Utilities		
Trucking and Warehousing	42	100%
Water Transportation	44	100%
Air Transportation	45	100%
Communication	48	50%
Electric, Gas & Sanitary Services	49	50%
Wholesale	50-51	100% *
Services		
Computer and Data Processing Services	737	100%
Auto Repair, Services and Parking	75	100%
Miscellaneous Repair Services	76	100%

*Less administrative/auxiliary workers. Actual figures vary by county.
Source: Hammer Siler George Associates

Projecting future industrial employment involved determining the portion of workers in each sector to consider industrial. This was done by referring to the most recent (1996) edition of the U.S. Census Bureau's *County Business Patterns* for employment by SIC category. Industrial employment was estimated by applying the factors listed in Table 10 to 1996 employment. For example, 50 percent of communication sector workers, and all auto repair workers, were considered industrial (and therefore contributors to the demand for industrial land). The resulting estimate of industrial workers by SIC category was used to derive industrial employment as a percent of total sectoral employment in each county. When detailed county-level data were not available for a sector, the metropolitan average for the remaining counties was used.

These percentages were applied to Metro's sectoral employment forecasts to estimate industrial employment in each county. County projections were then summed to estimate industrial employment in the Portland-Vancouver PMSA. Note that this methodology assumes a constant composition within sectoral categories in the future. In other words, the relative contribution made by each industrial category within the TCU and services sectors in each county is assumed constant through 2025.

Table 11 and Chart A shows the estimated number of industrial workers in the Portland-Vancouver PMSA in 2000 and 2020. For illustrative purposes, the table also shows the percentage of the region's 1998 workforce in each sector comprised of industrial workers. Because regional employment estimates were summed from individual county totals, this factor will vary in future years. A complete set of tables showing industrial employment projections by five-year intervals by county is included in Appendix A.

Table 11: Industrial Employment in the Portland-Vancouver PMSA

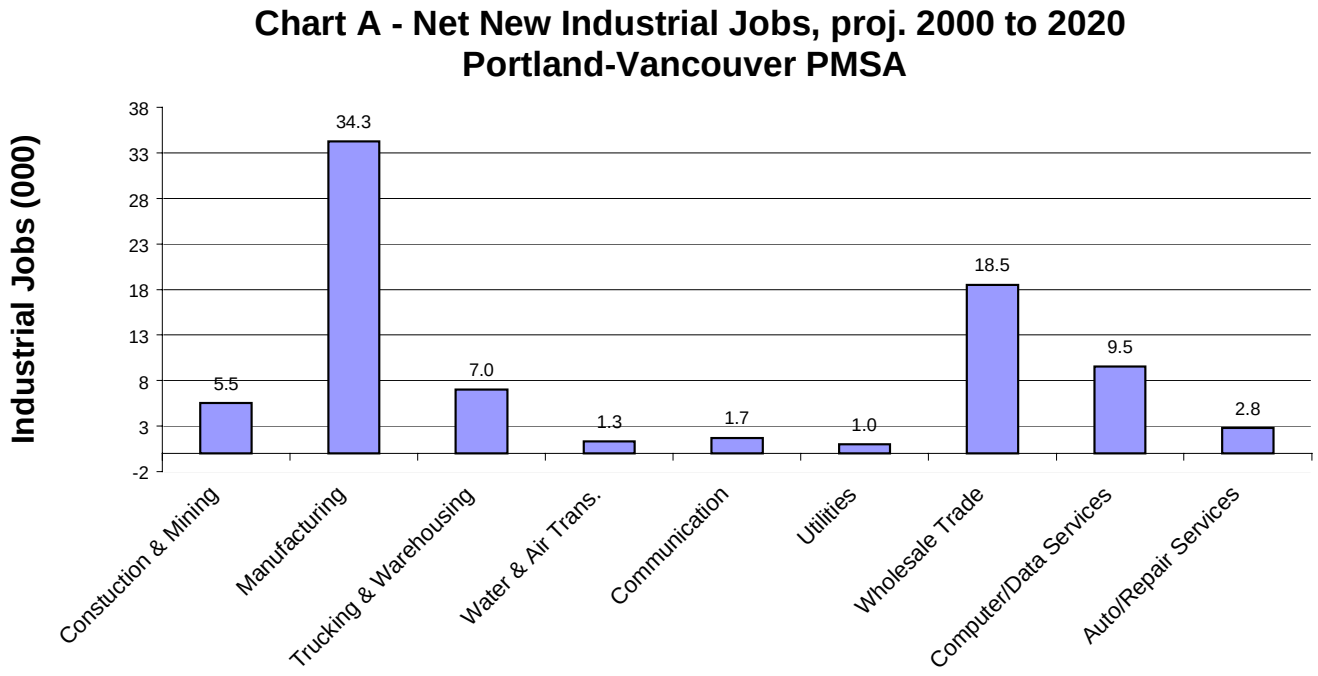
	Industrial Share of Sectoral Employment *	2000	2020	% Change 2000 – 2020
Construction and Mining	24.6%	19,726	25,257	28%
Manufacturing	96.8%	150,684	184,948	23%
Transportation, Communication & Utilities	68.0%	42,854	53,870	26%
Trucking and Warehousing	38.4%	23,290	30,322	30%
Water transportation	2.4%	3,118	3,413	10%
Air transportation	11.9%	6,738	7,724	15%
Communications	8.7%	6,059	7,761	28%
Electricity, gas, sanitation	6.6%	3,650	4,650	27%
Wholesale	95.1%	78,569	97,041	24%
Services	8.8%	35,825	56,178	57%
Computer, Data Processing	3.9%	16,230	25,764	58%
Auto Repair, Services, Parking	3.6%	14,375	22,383	56%
Miscellaneous Repair	1.3%	5,220	8,031	54%
Total Industrial Employment	**27.5%**	**327,659**	**417,295**	**27%**

** Based on allocations shown in Appendix Table A.9. The industrial shares shown are the 1998 average for the Portland-Vancouver PMSA.*

Source: Hammer Siler George Associates

Table 11 and Chart A show that the greatest number of industrial workers are found in the manufacturing and wholesale sectors. Industrial employment in both of these sectors is expected to grow by about 23 percent between 2000 and 2020. Not surprisingly, the growth of these traditional industrial sectors is superceded by the growth of industrial employment in the services sector. Between 2000 and 2020, the number of services sector workers occupying industrial land increases by 57 percent. Nonetheless, in terms of absolute numbers, the services sector accounts for fewer industrial workers than manufacturing and wholesale trade.

The number of industrial workers in the Portland-Vancouver PMSA is projected to increase by 27 percent between 2000 and 2020. Reflecting regional employment patterns, most industrial workers are located in Multnomah County, followed by Washington, Clackamas, Clark, Yamhill and Columbia counties. The greatest increases in industrial employment are projected to occur in Clark and Clackamas counties. As shown in the detailed breakdowns of employment in the Appendix, between 2000 and 2020, industrial employment in these two counties is projected to increase by 54 percent and 47 percent, respectively. Over the same period, industrial employment in Yamhill and Washington counties is projected to increase 37 percent and 33 percent, respectively. Columbia and Multnomah counties are projected to have the lowest industrial employment growth rates, at 11 percent and 8 percent, respectively.



Industrial Workers by Building Type

While there are many categorizations of building types, this study grouped industrial space into three categories: warehouse/distribution, general industrial, and tech/flex. These building types generally correspond with industrial inventory classifications used by major real estate brokers, including CB/Richard Ellis, Cushman & Wakefield, Grubb & Ellis, and Norris, Beggs & Simpson. Warehouse/distribution space is generally defined as high-bay space with loading docks and minimal office finished areas. General industrial space includes most manufacturing and repair shops, as well as the majority of industrial buildings under 10,000 square feet. Tech/flex space includes most freestanding corporate users, and incubator and flex space. In general, buildings in this latter category are of higher quality and located in more attractive settings.

Industrial workers in each county were assigned to building types according to the distribution factors shown in Table 12. This distribution was based on judgments among categories, and adjusted within the estimating procedures to the overall estimated total of each building type as reported in building inventories.

Table 12: Distribution of Industrial Workers to Building Types

	Warehouse/ Distribution	General Industrial	Tech/ Flex	Total
Construction and Mining		75%	25%	100%
Manufacturing		75%	25%	100%
TCU				
Trucking and Warehousing	100%			100%
Water transportation	100%			100%
Air transportation	100%			100%
Communications		50%	50%	100%
Electricity, gas, sanitation		50%	50%	100%
Wholesale	90%	10%		100%
Services				
Computer, Data Processing			100%	100%
Auto Repair, Services, Parking		100%		100%
Miscellaneous Repair		75%	25%	100%

Source: Hammer Siler George Associates

County distributions were summed to estimate the distribution of regional industrial workers to the three building types. Table 13 shows, by county, the distribution of workers added between 2000 and 2020 in each building category. Additional, rather than total, employment levels were used to estimate building space and land needs. This is because the projected employee densities and floor area ratios (FARs) apply to new growth, and may differ from past averages. A complete set of tables showing the distribution of industrial workers to building types in each county in five year intervals between 2000 and 2025 is included in Appendix B.

Table 13: Additional Industrial Workers by Building Type, 2000 – 2020

	Warehouse/ Distribution	General Industrial	Tech/ Flex	Total Workers
Clackamas County	9,090	9,051	4,819	22,960
Clark County	4,559	12,208	5,160	21,927
Columbia County	193	92	76	361
Multnomah County	4,192	3,940	2,651	10,784
Washington County	6,325	13,995	9,854	30,174
Yamhill County	578	2,027	825	3,430
Total	**24,937**	**41,313**	**23,385**	**89,636**

Source: Hammer Siler George Associates

Industrial Job Density

In order to estimate the future additional building space required by new workers, employee densities (square feet per employee) were estimated for each building type. These densities are based on information gathered from a variety of sources, including local industrial land inventories, other urban industrial markets, and industry standards. The sources used to estimate employee densities for this study are discussed below.

The CB/Richard Ellis inventory of industrial space, combined with RLIS data on properties under 10,000 square feet, provides the most comprehensive estimate of industrial space existing in the Portland region. This data set includes nearly 105 million square feet of warehouse/distribution space, almost 62 million square feet of general industrial space, and over 35 million square feet of tech/flex space. Adjustment for vacancy rates yields the estimates of occupied industrial space shown in Table 14. These estimates were divided by employment in corresponding industrial categories to derive an estimate of square feet per employee for current industrial space. (Because Portland's reported real estate inventory does not include Columbia and Yamhill counties, their employment was excluded from the calculation of employee densities.)

Table 14: Employment Densities in the Greater Portland Area, 1998*

	Industrial Employment	Occupied Square Feet	Occupied Square Feet per Employee
Warehouse/Distribution	99,298	98,624,832	993
General Industrial	137,867	58,091,465	421
Tech/Flex	67,052	33,190,317	495
Total/Average	**304,217**	**189,906,614**	**624**

*Excludes Columbia and Yamhill Counties

Source: CB/Richard Ellis, Hammer Siler George Associates

Data on new buildings and expansions added across the Portland region during 1997 and 1998, as compiled by the Port of Portland, provided another source of information regarding employee densities in the Portland area. The data was derived from various sources such as press announcements, economic development agencies and real estate firms. The data set, which covers nearly 7.0 million square feet of new space (almost all new space built during the two years) and 10,000 employees, is summarized in Table 15. Because this information includes building categories, it indicates employee densities in categories that are generally consistent with this study's industrial space definitions.

Table 15: Employee Density of New Firms and Expansions
Greater Portland Area, 1997 – 1998*

	Number of Employees	Square Feet	Square Feet per Employee
Food Processing	165	138,000	836
Distribution/Warehouse	1,655	2,808,000	1,697
High-tech	6,390	2,808,500	440
Metal Manufacturing	145	205,000	1,414
Other Manufacturing	1,905	988,300	519
Total	**10,260**	**6,947,800**	**677**

* Excludes Columbia and Yamhill Counties

Source: Port of Portland, Hammer Siler George Associates

Further information on employee densities was provided by data covering the number of employees and square feet of building space within the five industrial parks operated by the Port of Portland (see Table 16). The data includes both owner-occupied and leased space; and covers about 11.4 million square feet of building space and 12,000 workers. As this information does not include building types, an aggregate employment density of 907 square feet per employee was estimated for all industrial space. Given the nature of the Port's activities, this sample is weighted toward the warehouse/distribution category.

RLIS — Regional Land Information System

RLIS is a geographic information system database created and updated each year by Metro's Data Resource Center. The RLIS database consists of dozens of geographic, land use, socio-economic, public facility, and county assessor tax record data layers. The advantage of RLIS is its wealth of planning data and mapping applications.

Table 16: Employee Density at Port of Portland Industrial Areas

Location	Number of Employees	Square Feet	Square Feet per Employee
Mock's Landing*	1,543	1,604,602	1,040
Port Center*	1,198	355,995	289
Swan Island*	5,061	2,958,150	589
Rivergate	4,008	6,295,066	1,689
Portland International Center	442	195,431	442
Total	**12,252**	**11,409,244**	**907**

* Located on Swan Island

Source: Port of Portland

These local sources are generally consistent with employment densities and floor-area ratios estimated by other organizations, including:

- Metro's 1990 employment density study.
- Industry standards set by the Institute of Transportation Engineers – the "bible" of traffic generation data by land use.
- A 1997 study undertaken by the Puget Sound Regional Council; *Industrial Land Supply and Demand in the Puget Sound Region*.
- A 1996 analysis of the Portland region conducted by Hobson Johnson & Associates.

Table 17 summarizes the information gathered from the sources discussed above, and shows the employee densities applied in the current study. To project Portland's future industrial space needs, workers in warehouse/distribution space are assumed to occupy 1,100 square feet per employee. Workers in general industrial and tech/flex space are assumed to occupy 550 and 450 square feet per employee, respectively. Average employment space density for Port of Portland properties is estimated at 907 square feet per employee, but building type breakdowns are not available.

Table 17: Job Density by Building Type (square feet per job)

	Warehouse/ Distribution	General Industrial	Tech/ Flex
Greater Portland Area [1]	993	421	495
Recent Portland activity	1,697	601	440
Puget Sound Regional Council	1,121	594	594
Institute of Transportation Engineers	781	515	404
Estimates Used in this Study	**1,100**	**550**	**450**

[1] See as map labeled Figure 3; based on data provided by CB/Richard Ellis

Source: Compiled by Hammer Siler George Associates

The additional building space required to accommodate new workers was estimated by multiplying the projected growth in the number of industrial employees by the occupied square feet per employee for each building type. Application of a 6.0 percent vacancy rate yields the additional square footage requirements shown in Table 18. (See the Appendix A for a complete set of tables showing the additional square feet of building space required in each county in five-year intervals between 2000 and 2025.) Our projection of 64.55 million square feet of additional building space between year 2000 and 2020 represents average annual construction of approximately 3.22 million square feet. This compares with an estimated average gain of about 3.75 million square feet annually from 1990 through 1998.

Table 18: Additional Square Feet of Building Space Required
Portland-Vancouver PMSA, Projected 2000 to 2020

	Warehouse/ Distribution	General Industrial	Tech/ Flex	Total
Clackamas County	10,637,253	5,295,921	2,306,959	18,240,133
Clark County	5,335,144	7,143,069	2,470,074	14,948,287
Columbia County	226,222	53,955	36,226	316,403
Multnomah County	4,905,754	2,305,482	1,269,202	8,480,438
Washington County	7,401,796	8,188,605	4,717,285	20,307,686
Yamhill County	676,560	1,186,193	394,841	2,257,595
Total	**29,182,729**	**24,173,226**	**11,194,587**	**64,550,542**

Note: Individual counties may not sum to regional totals due to rounding.
Source: Hammer Siler George Associates

Additional Land Needs

The previous step estimated future space needs inside buildings to accommodate forecast employment growth. This stage of the analysis accounts for the total land area needed. This includes the building footprint plus areas outside the building structure for parking, truck maneuvering, storage, landscaping, stormwater treatment, setbacks and related site requirements.

The floor-area ratio (FAR) is the relationship of the footprint of a single story building to its building site. For a multi-story building, it is the relationship between the building's total square footage and the site. Most industrial use occurs in single story buildings. The land area required for new workers is estimated by dividing the square feet of building space these workers will need by the FAR, and converting to acres. Several sources, including other industrial properties and land use studies, as well as industry handbooks, were used to project industrial FARs for the Portland region.

For several properties located on industrial sites operated by the Port of Portland, information on both building and site size was provided. This sample was used to derive the FARs shown in Table 19. The square footage shown here differs from that of Table 16 since

compatible information was unavailable for all properties. Overall, FARs at the four industrial sites shown in Table 19 average 0.22.

Table 19: Port of Portland Industrial Floor Area Ratios

Location	Building Square Feet	Acres	FAR*
Mock's Landing	879,999	96.2	0.21
Port Center	417,740	27.4	0.35
Swan Island	1,658,634	131.3	0.29
Rivergate	6,259,703	684.3	0.21
Total	**9,000,541**	**939.2**	**0.22**

* Floor Area Ratio is calculated by dividing building floor area by total site land area.
Note: Based on a sample, not all properties, at each site.

Additional reference was made to industrial properties in other urban areas, although the information is not available on a strictly comparable basis. For example, overall FARs were calculated for industrial land developed in Colorado Springs, Colorado, since 1990. Records compiled by the El Paso County Assessor's Office indicate FARs ranging from 0.14 to 0.31 within nine planning areas, for an overall average of 0.20. Other sources of comparable data include the 1996 Hobson Johnson survey of Portland firms and project-specific data from around the country. Based on this, and other available industry information, the figures shown in Table 20 were used to project industrial land needs in the Portland region.

Table 20: Floor Area Ratios for Future Industrial Development Portland-Vancouver PMSA

Building Type	FAR
Warehouse/Distribution	0.33
General Industrial	0.30
Tech/Flex	0.22
All Industrial	0.29

Source: Hammer Siler George Associates

Additional industrial land needs in the study region were estimated by combining the acres required for each industrial building type and a "non-industrial usage rate." The non-industrial accounts for non-industrial users of industrial land, such as retail, office, hotels, and restaurants. The analysis assumes that 20 percent of the total acreage in future industrial areas would be non-industrial uses. This non-industrial land use assumptions was derived using Oregon Employment Department Employment Security (ES202) data which reflects reported numbers of workers that are "covered" by unemployment compensation insurance for each establishment. Since the location and standard industrial classification (SIC) for each establishment is also reported, Metro and Otak were able to analyze the types

of uses that occupy industrial subareas, such as the Tigard Triangle, Airport Way, and Rivergate.

Using the methodology described above (and as illustrated in Figure 4), the Portland-Vancouver PMSA will need at least 6,310 additional net acres of industrial land to accommodate new industrial workers between 2000 and 2020. As shown in Table 21 (the Appendix for a complete set of tables showing industrial land needs in each county in five-year intervals between 2000 and 2025), nearly one-third of the region's industrial land need is attributed to warehouse/distribution space requirements, followed closely by general industrial space (29 percent). Tech/flex space is forecasted to account for 19 percent of the region's industrial land needs.

Table 21: Expected Industrial Land Absorption (in Net Acres)
Portland-Vancouver PMSA, Projected 2000 to 2020

	Warehouse/ Distribution	General Industrial	Tech/ Flex	Non-Industrial *	Total
Clackamas County	740	405	241	346	1,732
Yamhill County	47	91	41	45	224
Columbia County	16	4	4	6	30
Multnomah County	341	176	132	163	813
Washington County	515	627	492	408	2,042
Oregon Subtotal	**1,659**	**1,303**	**910**	**968**	**4,841**
Clark County	371	547	258	294	1,469
Total	**2,030**	**1,850**	**1,168**	**1,262**	**6,310**

* Non-industrial usage rate calculated at 20% of total industrial land; based on Metro estimates.
Note: Acreage requirements by building type may not sum to county totals due to rounding.

Regional Facilities

The land needs projections described above do not include requirements for new or expanded airports, port facilities, rail yards, and other regional transportation facilities. The demand for regional transportation facilities for Portland such as marine, aviation, and rail facility expansion is outlined below.

Marine

The Portland Harbor, based on past marine absorption rates and cargo forecasts, will continue to need 33 to 49 acres of marine land per year. This translates to 686 to 1,021 acres of marine land in the next 20 years that will be needed for marine uses. This assumes the

marine cargo volumes will double in the next 30 years, according to the *Commodity Flow Analysis for the Portland PMSA*.[3]

These demand projections do not include any trends in efficiency or unknown future technology that could intensify the current land use ratio for marine facilities. They do include both public and private demand. This is limited to direct on dock water front demands. Reference for this information is the 1991 *Marine Terminals Master Plan*.[4]

Aviation

The 1998 PDX Master Plan projects that there will be additional aviation land requirements to meet the needs of increased passenger and cargo volumes over the next 20 years. The Master Plan has two alternatives, neither of which has been chosen currently. The Centralized Concept would require acquiring 47 lots encompassing 521 acres and the Decentralized Concept would require acquiring 74 lots and covering 679 acres.[5]

These projections only take into account expanding Portland International Airport for future aviation demand. They do not include expansion at the general aviation airports (Troutdale, Mulino, Hillsboro) which the Port of Portland owns and operates, nor do they take into account other general aviation airports in the Portland-Vancouver PMSA. Other alternatives such as expanding neighboring airports, construction of a new regional airport, or high speed rail have not been accounted for.

Rail

For the next 20 years, rail yard land demand in the Portland PMSA is included in the marine land absorption rates.[6] Demand for regional rail facilities will be associated with marine uses and thus the rail yard demand is discussed above in marine land absorption.

Given the importance of regional transportation facilities and their potential effect on buildable lands, a regional situation analysis and specific facilities planning should be incorporated into regional planning efforts.

Total Industrial Land Requirements

It is important to note that the projections shown in Table 21 of expected land absorption is in net acreage — that is, building sites only. It includes the land necessary to accommodate the growth in employment and associated building construction at typical densities. It does not include streets, open space or other public uses within industrially-zoned areas. These factors vary by the size and current development level of industrial areas and are addressed within this study's supply analysis. Additionally, the projection of net acreage required does not include a replacement factor for any land or buildings currently in industrial use that may be converted to another use or abandoned altogether.

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[3] *Commodity Flow Analysis for the Portland PMSA*, April 1999, ICF Kaiser, Columbus Group, Reebie Associates, the WEFA Group, and the Port of Portland.
[4] *Marine Terminals Master Plan*, 1991, Port of Portland Marine Department.
[5] *Portland International Airport Master Plan*, April 1998, P&D Aviation and Port of Portland
[6] Port of Portland, Marine Department

The land needs projections indicated in Table 21 also do not include an "elasticity" factor for additional land that must be available to provide an adequate choice of site and location so that the expected absorption can indeed be achieved. An "elasticity" factor is intended to reflect the amount of land necessary to actually meet job growth forecasts. In other comprehensive planning efforts, Hammer Siler George Associates has recommended a factor of 50 to 100 percent greater than net land needs to provide market flexibility and to present a full range of site and location alternatives.

A sufficient near-term industrial land supply must be available to meet immediate employer growth or expansion requirements. If employers looking for adequate industrial land find only one site, it is unlikely that the site will match their unique requirements for location, size, price level, development cost and transportation access. A similar industrial study for the Puget Sound Region recently determined that their regional buildable industrial land supply is 300%, or four times, more than their 20-year land demand requirements.[7]

Total projected land requirements do not need to be available and fully serviced at the beginning of the forecast period. It is important to note that buildable land can be brought on line over time as long as there is a "rolling inventory", much as we have in the Portland region through Metro's and Clark County's growth management procedures. Any rolling inventory should include sufficient acreage to provide adequate choice of available and unconstrained sites (as defined in the supply section) to a full range of industrial users — large and small, rail and highway served, high image and less restricted, and geographically in sync with the market. However, with an overall planning horizon of 2020, consideration should be given to where and how the total acreage needed will be provided.

Industrial Land Needs Sensitivity Analysis

A sensitivity analysis was conducted to evaluate the impact of alternative employment and land density factors on industrial land requirements. Appendix Table A.11 summarizes the results of calculating various land needs in the Portland-Vancouver region. In general, the sensitivity analysis shows that the ratios used in this demand analysis are at the high range (i.e., most dense) of alternative densities, and that land needs are projected conservatively on the low side.

In varying the density measures for sensitivity, it is not likely that employee density and floor-area ratios would increase concurrently. This is because, among other things, more on-site workers are associated with increased parking needs. While Hammer Siler George Associates believes that the baseline forecasts of 6,310 minimum net acres represents the most likely scenario for growth in Portland's industrial land requirements between 2000 and 2020, an additional alternative is shown in Table 22.

The baseline forecast is based on the industrial job growth projections and building and land density forecasts described earlier in this section. The second alternative depicts the densities represented by current Port of Portland properties. The latter scenario is presented as it provides a ready visual reference of the application of this density level over a large area. The sensitivity forecast also indicates the conservative approach supported by the baseline forecast.

[7] Puget Sound Regional Council, *Industrial Land Supply and Demand in the Central Puget Sound Region*, February 1998.

Table 22: Alternative Industrial Land Need Scenarios (Net Buildable Acres) Portland-Vancouver PMSA, Project 2000 to 2020

Development Scenario	Expected Land Absorption
Baseline Forecast	6,310 acres
Sensitivity Forecast [1]	10,485 acres

[1] Assumes job and building densities evidenced by Port of Portland industrial properties.

Industrial use does not provide the same opportunities for policy-directed, or even market-directed, densification, as does office or residential use. For example, industrial use is almost exclusively in single-story buildings, and land values render structured parking infeasible. Therefore, increased building density is achieved only through a reduction in parking, truck loading, open space, landscaping, and/or setbacks. Furthermore, higher land values, which, in the case of office and residential use, encourage conversion to higher densities, encourage higher-value non-industrial use on industrial land. While public policy and regulations can influence Floor area ratios (FARs), their impacts are more constrained in the industrial sector.

Employee density, on the other hand, is directly related to the type of firms who choose to locate and grow in the Portland area. The effectiveness of public policy on employee density depends on addressing issues relating to industrial recruitment targets, and incentives and tax policies designed to encourage higher density uses. Densification of industrial use in terms of building square feet per employee would require a shift away from the warehouse/distribution and trade activity that is an important part of Portland's economic base and would result in "trading" the value of the land resource with other disparent values, such as certain types of jobs and certain types of trade.

Implications of public policies on industrial densities would have to be carefully studied because they could impact some sectors more than others, and have unintended consequences, such as hurting the Port districts. Policy issues addressed in Phase 3 should consider the impact of a constrained land supply on the underlying growth dynamics of the region and the implications for the mix and type of jobs that can be attracted or retained.

Given the multitude of challenges and constraints to industrial development (e.g., compatibility of surrounding land uses, transportation access, parcel size and configuration, topography, availability, etc), jurisdictions and regions typically attempt to provide 50 to 300 percent more industrial land than they are forecasted to need over a 20 year planning period. A recent industrial land study in the Puget Sound Region concluded that there is a 300 percent market elasticity factor in their competitive market region as of winter 1999.

In the Portland-Vancouver PMSA, an elastic industrial supply of land is to be achieved through Oregon and Washington State's unique land use planning laws. In Oregon, a 20-year land supply is required and local/regional comprehensive plans are generally updated every five years to ensure that an adequate land supply is designated in urban growth boundaries.

In Washington State, the 1991 Growth Management Act requires similar long-range land use plans to be updated periodically. Clark County's Growth Management Plan limits the definition of competitive industrial land to include parcels that are in excess of ten acres and are served by adequate public facilities, such as roads, sewer, and power.

Key Findings

- Between 2000 and 2020, total non-farm employment in the Portland-Vancouver PMSA is forecast to increase by nearly half a million jobs, to approximately 1.65 million. Twenty percent of new employment over this period, about 90,000 jobs, is projected to require additional industrial land.
- Portland's industrial properties are characterized by warehouse/distribution, general industrial (including manufacturing), and tech/flex space. Almost half (46 percent) of the industrial workers added to the region between 2000 and 2020 will require general industrial space. The remainder of industrial workers are divided fairly equally between warehouse/distribution and tech/flex space.
- Including a vacancy factor of 6.0 percent (compares to current vacancy rate of 6.5 percent), approximately 65 million square feet of additional industrial building space will be required in the Portland-Vancouver PMSA between 2000 and 2020. Due to low employee densities for warehouse/distribution space, 45 percent of the need for additional space results from warehouse/distribution requirements. General industrial and tech/flex space account for 38 percent and 17 percent, respectively, of the demand for additional industrial building space.
- Actual industrial land requirements will vary by county and respective local and state land use planning policies.

Chapter 4 — Industrial Supply

This chapter explains how the industrial land inventory was qualified. It also includes an evaluation of parcels by classification of "buildability", parcel size, and location.

Supply Analysis Methodology

Several sources of supply information were used to compile and evaluate industrial lands. Available geographic information system (GIS) data were utilized to the extent possible. Appendix B includes a matrix comparison of available GIS data from Metro's Regional Lands Information System (RLIS) database, Clackamas County, and Clark County.

GIS data provided an important basis on which to evaluate industrial land supply. This study used July 1998 RLIS and Clark County GIS data. The methodology that was primarily utilized for the Portland Metro Planning Boundary and Clark County portion of the overall study area is illustrated in Figure 5.

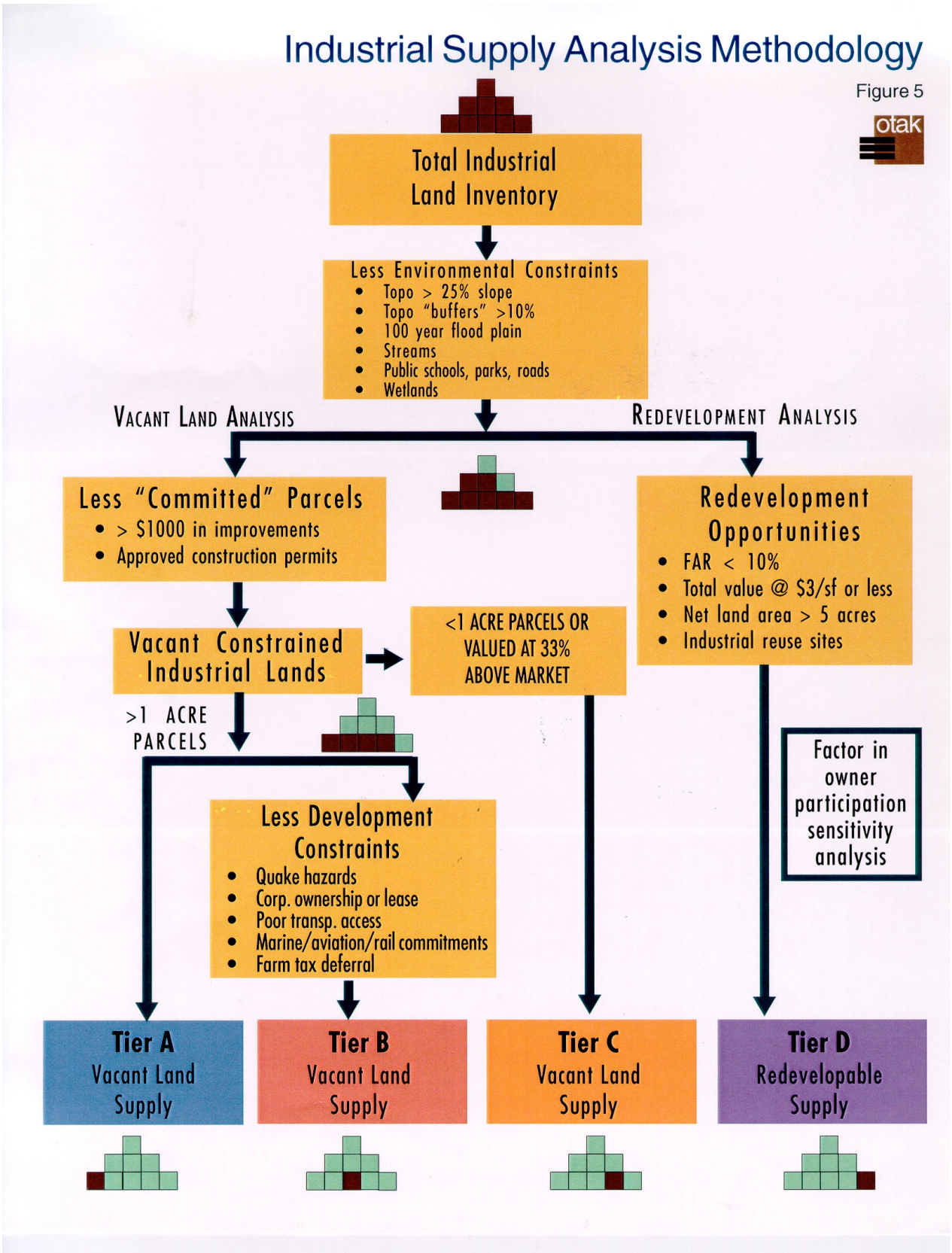
Primary Environmental Constraints

The supply is calculated by using an inventory of all industrial land that has a local comprehensive plan designation as "industrial". Any land that is not currently designated as industrial is not counted in the inventory. Hence, areas that are in the process of being planned for industrial use, but have not received official industrial comprehensive plan designations (such as West Hayden Island or any Urban Reserve Area) are not included in the industrial supply totals.

The first step in the supply methodology is to remove land that has steep slopes (with more than a 10 percent rise). Ten percent slopes include land that has 10 feet of vertical rise over a 100-foot distance.

Land with environmental constraints, including 100-year flood plains, existing rivers and streams, and current Metro Title 3 water quality buffers, was removed from gross supply. While current planning policy discussion continues over development code amendments required to comply with the recent listing of salmon and steelhead as federal endangered species, only existing development regulations including Title 3 stream corridor setbacks were assumed at this time.

Public lands also were removed from the industrial lands supply unless they were being held for future industrial development purposes. This exclusion was intended to exclude land associated with planned schools, roads, parks, jails, sewer/water infrastructure and utility easements. However, since the majority of public facilities are not "officially mapped" on local comprehensive plans, additions and adjustments is needed to account for these uses.


Industrial Supply Analysis Methodology
Figure 5
otak
Total Industrial Land Inventory
Less Environmental Constraints
• Topo > 25% slope
• Topo "buffers" >10%
• 100 year flood plain
• Streams
• Public schools, parks, roads
• Wetlands
VACANT LAND ANALYSIS
REDEVELOPMENT ANALYSIS
Less "Committed" Parcels
• > $1000 in improvements
• Approved construction permits
Redevelopment Opportunities
• FAR < 10%
• Total value @ $3/sf or less
• Net land area > 5 acres
• Industrial reuse sites
Vacant Constrained Industrial Lands
<1 ACRE PARCELS OR VALUED AT 33% ABOVE MARKET
>1 ACRE PARCELS
Factor in owner participation sensitivity analysis
Less Development Constraints
• Quake hazards
• Corp. ownership or lease
• Poor transp. access
• Marine/aviation/rail commitments
• Farm tax deferral
Tier A Vacant Land Supply
Tier B Vacant Land Supply
Tier C Vacant Land Supply
Tier D Redevelopable Supply

Vacant Land Supply

Once the environmental constraints were deducted from the industrial supply, land was classified as either "vacant" or "redevelopable".

Vacant land generally reflects parcels without high value improvements. The supply analysis assumes land with less than $1,000 in improvements, according to county assessor tax records is vacant. Sites that were under construction or had permits approved as of June 1998 were excluded from the vacant land inventory.

Redevelopable land includes land that has more than $1,000 in improvements, but has an overall land and improvement value that equates to $3.00 or less per square foot of parcel land area. Other factors in the redevelopment analysis include minimum parcel size of five acres, and potential industrial reuse sites (such as former lumber mill sites).

For the portion of the study area outside the Metro Planning Boundary, this study relied on interviews with local planning and community development officials and supplemented that information with any available GIS data. Hence, the level of specificity in areas outside the Portland Metro Planning Boundary and Clark County is not to the level of detail shown in Figure 5. Only gross vacant and redevelopable supply was tallied in those areas. Appropriate adjustment factors, which are described below, were used to estimate net buildable lands for communities outside the Metro Planning Boundary.

Industrial Supply Tiers

To better understand the nature of the vacant and redevelopment supply, all land was sorted into general "buildability" categories, or tiers, as noted below:

Tier A — includes *vacant sites* over one acre in adjusted gross buildable land area (after primary environmental constraints are deducted). Tier A properties are most likely to be developed since they are competitively price and have the least number of known development constraints (e.g., transportation access, soils, size, etc).

Tier B — includes *vacant sites (over one acre) that are constrained* by unstable soils, transportation access, farm tax deferral, corporate ownership (for internal expansion only) and/or lease-only provisions by the property owner. This category also includes land that is being held by port authorities with lease/sale constraints tied to specific uses that are marine- or aviation-related. This tier picks up corporate properties that have "land banked", for internal expansion, such as Nike and Intel.

Tier C — includes vacant *infill* sites (greater than one-half acre and less than one acre) and "*commercial valued*" sites (greater than one-half acre) that are currently assessed above $5.50 per square foot of land area. Since the market value is typically 20 percent higher than the assessed value, these sites would likely have market values that are $6.60 or higher per square foot. This category would tend to pick up industrial land that is actively being planned for commercial or mixed use.

Tier D — reflects land that has redevelopment potential but is constrained by buildings, brownfields and existing uses. There are sites that have not been partitioned (the underdeveloped partitioned sites that are under corporate ownership have been recorded under Tier B). In areas outside the Portland Metro UGB and Clark County (where GIS data was limited), a 35 percent factor was used to account for environmental constraints such as steep slopes, wetlands, and stream corridors.[8] A property participation adjustment of 33 percent was assumed to account for owners who are unwilling (or unable to afford) to redevelop their properties for industrial reuse despite being included in Tier D.

Gross To Net Assumptions

The calculation of net buildable land takes into account land set aside for roads, parks, utilities, and other public facilities by assuming 27 percent of the gross acres will be devoted to public uses for tiers A, B, and D. A 15 percent net gross adjustment factor was used for tier C (infill).[9]

Industrial Inventory Review and Refinement Process

An important step in the supply methodology included involvement of a Technical Advisory Committee (TAC), made up of study partners, along with local jurisdictions and interested private stakeholders such as industrial brokers, agriculture interests, and consultants. Preliminary supply inventory maps were issued in March 1999 and placed on display at two public open houses held in Portland and Vancouver. The open houses provided an opportunity for the public to review and comment on the study objectives, supply and demand methodologies, and specific parcels identified by tier on draft maps. The open house feedback was used to fine tune our methodology and make specific map changes. Open house records are included in the Appendix.

Draft supply maps and supply methodology were sent to local jurisdictions for their review and comment. Individual meetings and interviews were also conducted, as needed, to answer questions about the study and to request feedback on the methodology. The list of jurisdictions and their staff that participated in this review is provided in the Appendix.

Internal review of the draft supply maps also was conducted by the Port of Portland with particular focus on its land holdings. Once again, appropriate supply mapping refinements were made using their input on buildable land supply.

The representative industrial land supply maps in the Appendix illustrate specific parcels that comprise the industrial lands inventory for portions of the Portland-Vancouver PMSA. The maps are included to provide a general reference for what constitutes the buildable lands database. The industrial supply maps have been subjected to analysis using available GIS data, and have been reviewed and refined using input from the TAC, and several local jurisdictions and real estate brokers.

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[8] Estimates were derived from the *Metro Urban Growth Report Addendum*, August 1998.

[9] Estimates were derived from the *Metro Urban Growth Report Addendum*, August 1998.

The actual amount of developable industrial land area will vary on individual parcels — some greater than or less than the amount of land shown on the maps. Given the ever-changing nature of the real estate industry, the maps tend to be outdated almost as soon as they are printed. Nevertheless, these data comprise the most extensive industrial lands database that has yet been compiled for the study region.

Industrial Land Inventory

Using the methodology outlined above, it is estimated that there are currently 9,198 net buildable acres within the six-county Portland-Vancouver PMSA. As indicated in Table 23, about one-third of this supply is in Clark County and two-thirds in the five Oregon counties. Clark County has the largest industrial land inventory with 2,869 net buildable acres, followed by Multnomah County (2,572 acres), Washington County (1,766 acres), Columbia County (883 acres), Clackamas County (865 acres), and Yamhill County (243 acres).

Table 23: Net Buildable Industrial Supply by Tier
Portland-Vancouver PMSA

County	Tier A	Tier B	Tier C	Tier D	Total	Percent
Clackamas	47	651	-	166	865	9%
Multnomah	442	1,960	87	83	2,572	28%
Washington	483	1,205	26	53	1,766	19%
Columbia	70	590	-	223	883	10%
Yamhill	-	238	-	5	243	3%
Oregon Subtotal	**1,042**	**4,644**	**5,538**	**530**	**6,329**	**69%**
Clark	1,345	1,163	71	290	2,869	31%
Total	**2,387**	**5,807**	**184**	**820**	**9,198**	**100%**

Note: Data may not add due to rounding.

Chart B - Industrial Acres in Study Region
Total Industrial Inventory = 9,198 buildable acres

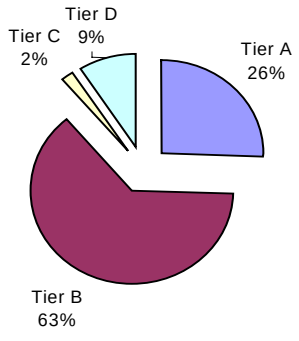


Chart C - Buildable Industrial Acres by County

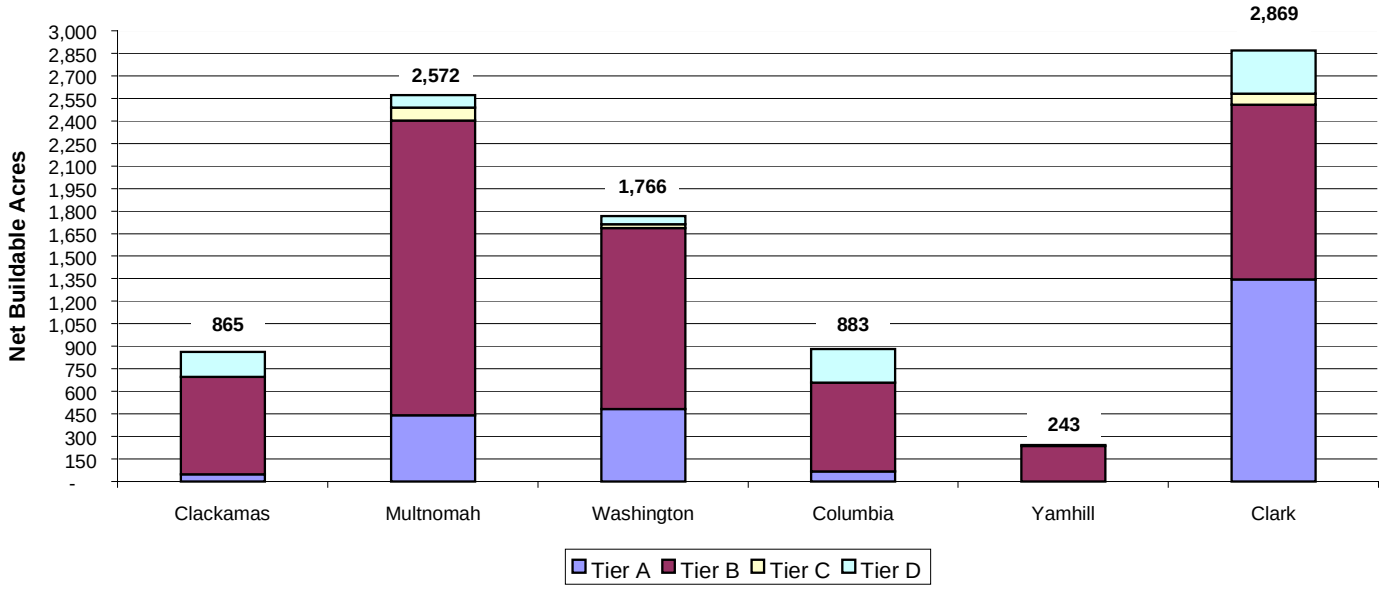
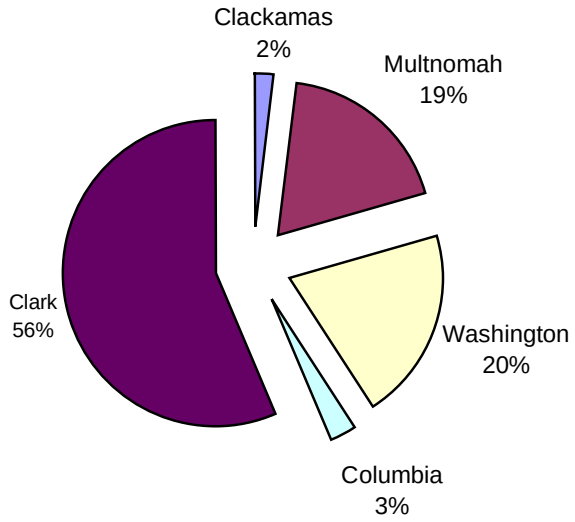


Chart D - Tier A Buildable Industrial Acres by County



Total Tier A Supply = 2,387 acres

As illustrated in Chart B, only 28 percent of 2,387 acres are classified as Tier A. The majority of the industrial supply is in the more constrained Tier B category. Tier C (infill) supply accounts for only 2 percent of the buildable land inventory, while Tier D (redevelopment) comprises 9 percent of the inventory.

Analysis of Industrial Inventory by Tier Classification

To better understand the nature of the existing land supply, it has been sorted into classifications of "buildability" or tiers as described above. Our analysis of the Tier A supply

is depicted in Chart D, and the prior tables. Key conclusions regarding the analysis of industrial by land tier:

- The Tier A supply accounts for 2,387 acres or 26 percent of the net buildable industrial land inventory in the Portland-Vancouver PMSA.
- The majority of Tier A land (56 percent) is located in Clark County.
- The Tier A distribution within Oregon is primarily in Washington County (483 acres), Multnomah County (442 acres), and Columbia County (70 acres). Clackamas County has only 47 net buildable acres of Tier A supply.
- Most of the PMSA's buildable industrial supply (63 percent) is in Tier B — land that is constrained for development. Much of this supply is located in outlying rural areas of the Portland-Vancouver PMSA, such as in Columbia County or Canby, were regional transportation access is an issue.
- Vacant infill and commercially priced Tier C land accounts for approximately 2 percent of the overall industrial buildable land inventory.
- Tier D includes an estimated 820 acres of potentially redevelopable land, or 9 percent of the net buildable industrial land inventory in the Portland-Vancouver PMSA.

Analysis of Parcel Size

Parcel size and location are very important factors affecting the potential to accommodate industrial expansion or to attract new business. The distribution of buildable industrial parcels (all tiers) within the Portland-Vancouver PMSA is shown in Table 24 and Chart E. Key findings include:

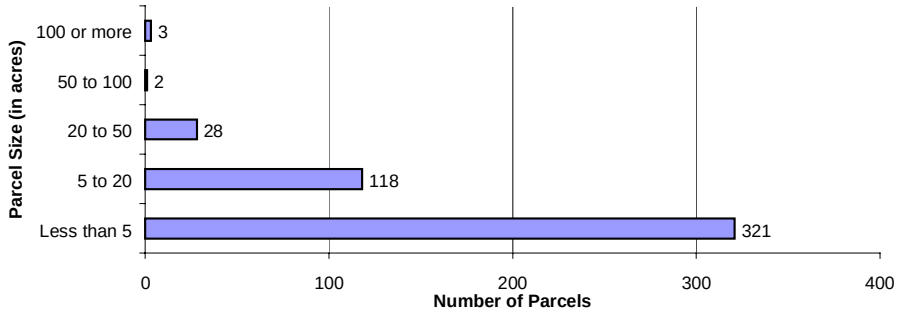
- 62 percent of the buildable industrial inventory is in parcels smaller than five acres in size;
- Over 82 percent of the buildable industrial inventory is less than 10-acre parcel configurations;
- Only 2 percent of the buildable industrial sites are in parcels greater than 50 acres;
- There are only nine parcels greater than 100 acres and only three of those are Tier A;
- The only parcel greater than 200 acres is in Clark County at the Port of Vancouver location; and
- If we consider only Tier A properties, then over two-thirds of the buildable industrial sites are in parcels of less than five acres.

Table 24: Distribution of Buildable Industrial Parcels by Size and Location

Total Industrial Supply — Selected Counties										
	1 or less	**1 to 5**	**5 to 10**	**10 to 20**	**20 to 50**	**50 to 75**	**75 to 100**	**100 to 200**	**200 or more**	**Total**
Clackamas	69	133	55	16	7	1	0	0	0	281
Multnomah	122	248	107	62	41	4	3	4	0	591
Washington	35	133	57	40	30	2	1	2	0	300
Clark	132	229	120	50	38	6	4	2	1	582
Total	**358**	**743**	**339**	**168**	**116**	**13**	**8**	**8**	**1**	**1,754**
Distribution	**20%**	**42%**	**19%**	**10%**	**7%**	**1%**	**0.5%**	**0.5%**	**0.1%**	**100%**
Tier A Industrial Supply — Selected Counties										
	1 or less	**1 to 5**	**5 to 10**	**10 to 20**	**20 to 50**	**50 to 75**	**75 to 100**	**100 to 200**	**200 or more**	**Total**
Clackamas	5	17	4	0	0	0	0	0	0	26
Multnomah	20	39	20	5	6	0	0	1	0	91
Washington	16	58	18	5	6	0	0	1	0	104
Clark	13	153	42	24	16	0	1	1	0	250
Total	**54**	**267**	**84**	**34**	**28**	**0**	**1**	**3**	**0**	**471**
Distribution	**11%**	**57%**	**18%**	**7%**	**6%**	**0%**	**0%**	**0%**	**0%**	**100%**

Source: compiled by Otak, Inc, based on RLIS and Clark County GIS information.

Chart E - Distribution of Industrial Parcels by Size
Portland-Vancouver PMSA*



* Also reflects Tier A land in Columbia County

Emerging Regulatory Trends

During the time this study was conducted, the US Congress listed Willamette Valley and Steelhead Salmon as an "threatened and endangered species" for protection under the National Environmental Policy Act. The Oregon Department of Fish and Wildlife, Metro, and other federal, state, and local agencies are now in the process of reviewing state, regional, and local land use regulations to further protect fish and wildlife. In Oregon, new regulations under Metro's Title 3 regulations will likely result in a reduction in buildable lands as building setbacks and stream corridor buffers are increased for fish and wildlife habitat. Preliminary analysis by Metro indicates that new Title 3/ESA regulations could reduce buildable industrial lands by over 750 acres within the Metro UGB.

Conclusions

The supply methodology used in this study provides a good understanding of remaining buildable industrial land in the Portland-Vancouver PMSA. These findings indicate that approximately 26 percent or 2,387 acres of the net buildable supply is characterized as Tier A (without major development constraints). The remaining 74 percent of the supply is constrained by such factors as transportation, ownership, size, redevelopment costs, and outlying rural location. Hence, it is expected that the Tier A supply will be absorbed more quickly by the market than the other more constrained buildable lands.

With over 60 percent of the total industrial land inventory in parcels of less than five acres, and more than 80 percent of the supply is in parcels of less than 10 acres, there is a limited "window of opportunity" for major industrial expansions or new tenant move-ins.

Chapter 5 — Study Findings

This chapter compares the results from Chapter 3 Industrial Demand and Chapter 4 Industrial Supply to make a determination on the industrial supply and demand balance for the Portland-Vancouver PMSA.

Before an analysis of supply and demand can be made, it is important to observe the nature of the existing industrial inventory, and the type of land demand assumptions that are implicit to the Metro regional job growth forecasts. Metro's Data Resource Center forecasts of job growth were used in this analysis to determine industrial land needs (demand). Like most economometric forecasts, the job growth forecasts take into account U.S. Department of Commerce, Bureau of Economic Analysis (BEA) national and regional job forecasts (for the Portland-Vancouver PMSA). Metro redistributes BEA's regional forecasts.

It is important to note that the BEA and the Metro job forecasts assume an "elastic supply" of land. This basically means that the job growth forecasts will only be achieved if the land supply is always in sync with, or exceeds in choice options, market needs.

Industrial tenant locational decisions are typically made over a period of a few months or weeks. A decision to locate or expand operations in the Portland-Vancouver PMSA results after a direct comparison of disparate areas throughout the United States. Typical decision criteria take into account site development constraints such as land availability, land acquisition/development costs, operational costs, and proximity to markets.

Given the importance of site development constraints, the buildable industrial lands have been sorted into four tiers. While all of the land inventoried in this supply analysis is technically "buildable", it does not function equally in meeting tenant requirements. For example, a small infill parcel cannot meet the needs of a large 10-acre prospect. Nor can a site in Multnomah County always suit the needs of a software manufacturer that requires close proximity to its high tech clients who may happen to be in Washington County.

To give an example of the consequences of an inelastic land supply: Company XYZ desires to locate its high-tech widget plant in Washington County and needs 10 acres of buildable land with good freeway access. If Company XYZ cannot immediately find a suitable site in Washington County, it could likely locate outside the Portland-Vancouver PMSA, potentially in a state other than Oregon or Washington. Hence, the study area's job growth forecasts will not be achieved if the regional land supply is "inelastic" or not in sync with market demand.

Subregional Conclusions

If we compare the county industrial land demand forecasts from Chapter 3 with the available industrial land inventory, we can draw conclusions on whether specific counties are in sync with expected industrial job growth.

As shown on Table 25, the forecasted 20-year net buildable land requirements for the PMSA is 6,310 acres almost three times greater than the Tier A inventory (2,387 acres).

Table 25: Summary of Industrial Land Demand and Supply (Net Buildable Acres) Portland-Vancouver PMSA, Projected 2000 to 2020

	Demand	**Supply[1]**	
County	Buildable Land Requirements	Total Net Available Industrial Inventory	Net Available Tier A Inventory
Clackamas	1,732	865	47
Multnomah	813	2,572	442
Washington	2,042	1,766	483
Columbia	30	883	70
Yamhill	224	243	—
Oregon Subtotal	**4,841**	**6,329**	**1,042**
Clark	1,469	2,869	1,345
Total	**6,310**	**9,198**	**2,387**

Source: Hammer Siler George Associates, and Otak, Inc.
[1] Derived from Table 23

Subregional conclusions from the industrial supply-demand analysis include:

- Clackamas County has a serious industrial supply-demand imbalance; additional industrial land is needed to meet job growth forecasts.
- Multnomah County requires methods to remove Tier B development constraints to increase the marketable supply of industrial land.
- Washington County also will experience a shortage of industrial land if development constraints are not removed from Tier B lands.
- Clark County appears to have a “tight” supply of industrial land over the long term. However, the paucity of Tier A land in Oregon will likely drive up Clark County's industrial land demand, thereby resulting in faster absorption of Clark County land than is forecasted in the baseline scenario. This in turn will also necessitate the long run need to remove development constraints from Tier B lands.

When the original Metro UGB was determined in 1980, there was intended to be a 20-year inventory of land for all types of future development. A period of sluggish economic growth in the Pacific Northwest followed during the early 1980s. As the regional economy picked up steam in 1985, the supply of available unconstrained industrial lands was more than adequate. Now, the Portland-Vancouver PMSA approaches its 16th year of economic prosperity, and 19 years after the first UGB was established, it is evident that the majority of prime industrial sites have been built-out or acquired by corporate tenants for future internal expansion.

The make-up of the existing industrial supply inventory indicates that few large buildable industrial land areas remain, while hundreds of smaller urban remnant parcels exist. Approximately 62 percent of the Tier A industrial land inventory is in parcels of less than 5 acres and over 81 percent of the inventory is in 10-acre parcels or smaller. Only three Tier A parcels of more than 100 acres exist in the PMSA.

Given the importance of the Tier A supply in meeting industrial job growth forecasts, an analysis was conducted to determine how long it will take to use up the remaining Tier A supply in each county. For the purpose of this analysis we assumed that 75 percent of the land absorption is accommodated by Tier A supply. This assumption is generally consistent with recent Metro Data Resource Center findings contained in their preliminary *Urban Growth Report*, June 1999.

Based on these assumptions, the number of years until each county's Tier A supply will be depleted is forecasted as:

Clackamas County	1 year
Multnomah County	10-14 years
Washington County	4-5 years
Clark County	14-18 years

In summary, the Tier A industrial land supply in the study area appears sufficient to accommodate only a fraction of the forecasted land for job needs and job forecasts.

Chapter 6 — Policy Considerations and Next Steps

This chapter is intended to "set the stage" for follow up land policy discussions that occur during periodic review of regional and local land use plans. State and regional industrial development incentives and strategic investment strategies also are preliminarily identified for further consideration.

Legal Requirements

In Oregon, the Metro code and state land use statutes (including administrative rules) require that the Metro Council review the estimated capacity of the existing regional Urban Growth Boundary at least every five years for each 20-year period. Metro Council is required to analyze and to provide sufficient capacity to accommodate the forecasted land need. State Land Use Planning Goal 9, Economic Development also requires local jurisdictions in Oregon to provide a 20-year industrial (and commercial) land supply sufficient to accommodate a variety of users.

The Growth Management Act in Washington State requires Clark County to periodically update its comprehensive plan, and to maintain a land use plan that is consistent with adequate public facilities. Clark County Growth Management Plan policies attempt to qualify competitive industrial land by focusing on parcels in excess of ten acres and those served by adequate public facilities, including roads and sewer systems.

Hence, the availability of industrial land is a very important long-range planning consideration for both Oregon and Washington. To better understand the affects of the existing situation, this study preliminarily considers the direct and indirect job growth impacts attributed to industrial land.

Analysis of Existing Situation

This analysis assumes no additions to the existing industrial land inventory nor any significant public or private effort to remove development constraints on Tier B, C, and D properties. As Tier A land gets depleted, industrial job growth will hinge on the ability of Tiers B, C, and D to satisfy and accommodate industrial land needs. As indicated in the previous chapter, Tier A land is expected to be depleted at varying time periods depending upon location and forecasted absorption levels.

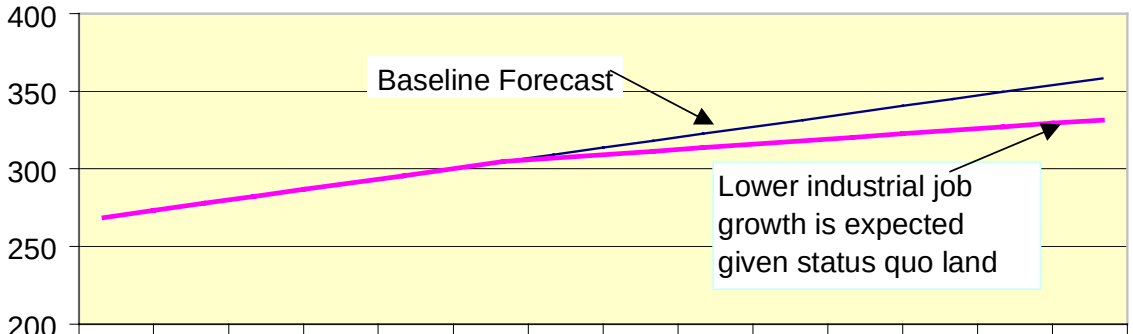
An illustrative trending analysis was conducted for the tri-county Metro Region (including portions of Clackamas, Multnomah, and Washington counties). In the industrial job growth analysis shown in Chart F, if we assume that three-quarters of the industrial absorption occurs in Tier A and one-quarter in the other supply tiers, it is evident that the majority of the Tier A supply in the metro region will be depleted within five years.

What happens when most of the remaining Tier A lands are substantially used up? In the existing situation analysis, we assume that after Tier A is depleted, the absorption of Tiers B, C, and D will increase to accommodate 50 percent of the forecasted land (compared to 25 percent today). If this occurs, it is likely that between 40 to 60 percent of the potential industrial job growth will be lost from the Metro region, since the region will not have the land supply needed to recruit or retain industry. The cost in lost industrial jobs is forecasted to be approximately 27,000 industrial jobs over a 20-year time period.

The indirect impact of the opportunity cost of lost industrial job growth will be evidenced by lost secondary jobs in sectors such as finance, real estate and retail. According to the Metro Data Resource Center, the indirect job impacts are typically 2.5 times the direct industrial job impacts. As indicated in Chart G, the total opportunity cost to the Portland UGB of lost job growth potential due to inadequate Tier A industrial land supply is projected to be 94,000 jobs over 20 years.

Additional direct/indirect impacts of lower job growth include lower potential growth in state income tax, Tri-Met payroll tax, local property tax, and business license tax revenues. A reduction in potential basic industry jobs means there will be fewer quality jobs with family wage levels in the region. Hence, household income levels and housing affordability will be negatively impacted by this scenario.

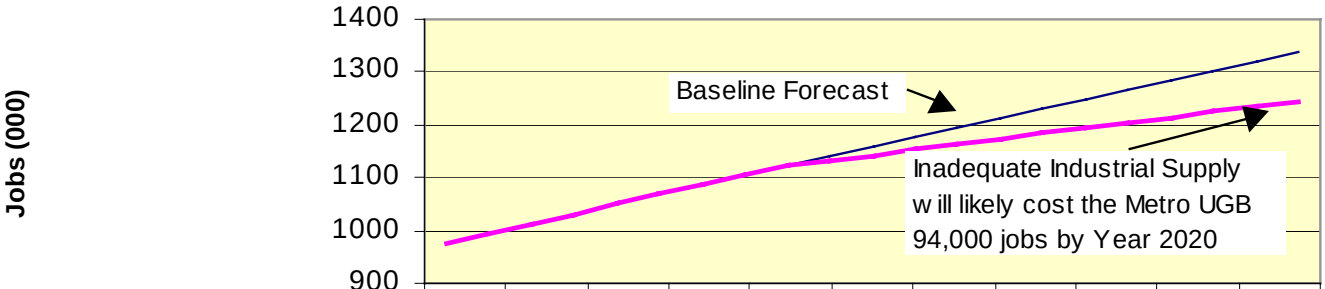
Chart F - Industrial Job Growth Forecasts, Metro UGB



year:	2000	2002	2003	2005	2006	2008	2009	2011	2012	2014	2015	2017	2018	2020
Base Forecast	269	278	282	291	296	305	309	318	322	331	336	345	349	358
Status Quo Scenario	269	278	282	291	296	305	307	311	314	318	320	325	327	331

If the industrial land supply imbalance continues unchecked, regional jobs and housing forecasts will certainly need to be revised downward.

Chart G - Total Job Growth Forecasts, Metro UGB



year:	2000	2002	2004	2006	2008	2010	2011	2013	2015	2017	2019
Base Forecast	977	1013	1050	1086	1122	1158	1176	1213	1249	1285	1321
Status Quo Scenario	977	1013	1050	1086	1122	1143	1153	1173	1194	1214	1235

Policy Options for Increasing Tier A Inventory

There are basically two options for increasing the Tier A land inventory: 1) removing the development constraints to Tier B, C and D; and 2) adding land to Tier A from urban reserves.

If Tier B development constraints can be removed, it will certainly increase the amount of "marketable" industrial land. Shifting land from Tier B to Tier A could be accomplished in several ways, such as:

- Utilizing public agencies such as the Portland Development Commission, the Port of Portland; Port of Ridgefield (and others) to proactively acquire land that is being "land banked" by corporations, individuals or trusts and facilitate its development;
- State and local government provision of development incentives such as elimination of farm tax deferral, and/or tax abatement for industrial redevelopment on selected parcels to encourage industrial development;
- State and/or regional government creation of an urban industrial redevelopment low-interest loan fund and/or grant programs that can be used for environmental remediation and seismic upgrade improvements.
- Eliminating transportation constraints by investing in capital facilities that improve service levels at "intolerable" intersections;
- Metro and local agencies working closely with large corporate land owners to proactively master plan their real estate holdings for future internal expansion and possible external development through appropriate plan review and partitioning processes.

Adding Tier A industrial lands as urban reserves are brought into the Portland UGB and as land is annexed by Clark County local UGAs, is another method of addressing the industrial supply imbalance. Given the relatively low value of industrial development in comparison to residential and commercial development, appropriate locations for industrial development need to be carefully selected, then adhered to during the comprehensive plan and zone change amendment processes.

Next Steps

This study provides a foundation of information needed to understand the current status of industrial land needs in the greater Portland-Vancouver PMSA.

Recommended next steps include:

1. Determine how much the Portland-Vancouver PMSA (and its subregional jurisdictions) can depend on Tier B, C, and D lands to meet industrial user requirements.

2. Consider public policies to increase the amount of industrial land available for development such as:
   - Providing a 5 to 10-year rolling inventory of Tier A lands;
   - Adopt appropriate local industrial land use code amendments that preserve land for industrial development; and
   - Designate future urban revenues for industrial development.

3. Determine how best to finance the removal of development constraints from Tier B, C, and D lands;

4. Continue bi-state dialog with public and private sectors to raise awareness of industrial needs and to work toward strategic solutions which build on the growth management programs of both states.

With an understanding of the characteristics of available industrial lands and the dynamics of job growth forecasts, policy officials can hopefully make planning decisions that result in continued economic growth, prosperity and opportunity for all citizens.

Appendix A -- Demand Analysis

Portland Regional Industrial Lands Study
Demand Analysis: Appendix Tables

Table A.1
Sectoral Employment and Population, 1990 - 2025
Portland Metropolitan Area

	1990	1995	1998	2000	2005	2010	2015	2020	2025
Total Nonfarm Employment	894,924	1,040,340	1,150,098	1,200,161	1,320,109	1,431,685	1,540,055	1,647,403	1,752,109
Construction and Mining	50,176	63,120	76,559	80,256	88,085	93,962	99,731	102,980	107,820
Manufacturing	130,893	145,210	150,225	155,604	166,522	175,139	182,736	190,665	200,443
TCU	47,502	54,560	61,718	63,157	67,231	71,339	75,844	80,537	85,326
Wholesale	61,183	71,648	80,097	82,539	87,725	92,644	97,428	101,948	106,315
Retail	150,254	174,172	188,677	196,877	214,969	232,168	250,348	268,862	281,305
FIRE	72,063	81,750	88,846	92,650	101,278	109,648	118,387	127,151	135,690
Services	263,906	322,450	366,729	389,207	444,764	498,650	549,502	601,074	653,620
Other	118,947	127,430	137,248	139,871	149,536	158,135	166,079	174,187	181,590
Population	1,515,451	1,710,400	1,814,080	1,876,580	2,026,110	2,181,190	2,334,940	2,487,520	2,629,710

Annual Growth Rate

	1990-1995	1995-1998	1998-2000	2000-2005	2005-2010	2010-2015	2015-2020	2020-2025
Total Nonfarm Employment	3.1%	3.4%	2.2%	1.9%	1.6%	1.5%	1.4%	1.2%
Construction and Mining	4.7%	6.6%	2.4%	1.9%	1.3%	1.2%	0.6%	0.9%
Manufacturing	2.1%	1.1%	1.8%	1.4%	1.0%	0.9%	0.9%	1.0%
TCU	2.8%	4.2%	1.2%	1.3%	1.2%	1.2%	1.2%	1.2%
Wholesale	3.2%	3.8%	1.5%	1.2%	1.1%	1.0%	0.9%	0.8%
Retail	3.0%	2.7%	2.2%	1.8%	1.6%	1.5%	1.4%	0.9%
FIRE	2.6%	2.8%	2.1%	1.8%	1.6%	1.5%	1.4%	1.3%
Services	4.1%	4.4%	3.0%	2.7%	2.3%	2.0%	1.8%	1.7%
Other	1.4%	2.3%	1.0%	1.4%	1.1%	1.0%	1.0%	0.9%
Population	2.4%	2.0%	1.7%	1.5%	1.5%	1.4%	1.3%	1.1%

Note: "Other" includes federal, state and local government workers, and proprietors in Yamhills and Columbia Counties.
Source: Metro

Table A.2
Industrial Employment, 1998 - 2025
Portland Metropolitan Area

	Industrial Workers as Percent of Sectoral Employment *	1998	2000	2005	2010	2015	2020	2025
Total Industrial Employment	27.5%	316,066	327,659	353,147	375,551	396,713	417,295	440,075
Construction and Mining	24.6%	18,823	19,726	21,640	23,071	24,473	25,257	26,431
Manufacturing	96.8%	145,451	150,684	161,312	169,734	177,173	184,948	194,525
TCU	68.0%	41,940	42,854	45,468	48,075	50,926	53,870	56,873
Trucking/Warehouse	38.4%	22,710	23,290	24,912	26,572	28,399	30,322	32,282
Water Transportation	2.4%	3,095	3,118	3,203	3,278	3,354	3,413	3,466
Air Transportation	11.9%	6,648	6,738	7,017	7,250	7,495	7,724	7,970
Communications	8.7%	5,916	6,059	6,454	6,858	7,302	7,761	8,222
Electricity, Gas, Sanitation	6.6%	3,571	3,650	3,881	4,117	4,375	4,650	4,932
Wholesale	95.1%	76,218	78,569	83,525	88,219	92,770	97,041	101,169
Services	8.8%	33,635	35,825	41,203	46,453	51,370	56,178	61,078
Computer, Data Processing	3.9%	15,180	16,230	18,785	21,288	23,605	25,764	27,955
Auto Repair, Service, Parking	3.6%	13,533	14,375	16,462	18,496	20,423	22,383	24,387
Miscellaneous Repair	1.3%	4,923	5,220	5,957	6,669	7,342	8,031	8,735

* Based on allocations shown in Table A.9. The factor shown is the 1998 average for metropolitan area counties.
It will vary in future years since this table is constructed from individual county totals.

Table A.3
Distribution of Industrial Workers to Building Type
Portland Metropolitan Area

	1998	2000	2005	2010	2015	2020	2025
Warehouse/Distribution	101,049	103,858	110,305	116,497	122,741	128,796	134,770
General Industrial	145,173	150,952	163,310	173,589	183,003	192,266	203,233
Tech/Flex	69,844	72,848	79,532	85,466	90,968	96,233	102,072
Total Industrial Workers	316,066	327,659	353,147	375,551	396,713	417,295	440,075

Note: Based on distribution of workers by building type as shown in Table A.10.

Table A.4
Industrial Workers by Building Type Added During Period
Portland Metropolitan Area

	2000-2005	2005-2010	2010-2015	2015-2020	2020-2025	2000-2025
Warehouse/Distribution	6,446	6,192	6,245	6,055	5,974	30,912
General Industrial	12,359	10,278	9,415	9,262	10,967	52,281
Tech/Flex	6,684	5,934	5,503	5,264	5,839	29,224
Total	25,489	22,404	21,162	20,582	22,780	112,417

Table A.5
Employment Density Factors
Portland Metropolitan Area

	Occupied Sq Ft per Employee	Floor Area Ratio*	Employees per Acre
Warehouse/Distribution	1,100	0.33	13.07
General Industrial	550	0.30	23.76
Tech/Flex	450	0.22	21.30

* Square feet of building space divided by square feet of land

Table A.6
Additional Industrial Space in Square Feet Required by Building Type, 2000 - 2025
Portland Metropolitan Area

	2000-2005	2005-2010	2010-2015	2015-2020	2020-2025	2000-2025
Warehouse/Distribution	7,543,600	7,245,700	7,307,600	7,085,800	6,990,700	36,173,400
General Industrial	7,231,100	6,014,000	5,508,600	5,419,500	6,416,800	30,590,000
Tech/Flex	3,199,600	2,840,500	2,634,200	2,520,200	2,795,500	13,990,100
Total	17,974,300	16,100,200	15,450,400	15,025,500	16,203,000	80,753,500

Note: Industrial Vacancy Rate: 6%

Table A.7
Additional Land Needs in Acres by Building Type, 2000 - 2025
Portland Metropolitan Area

	2000-2005	2005-2010	2010-2015	2015-2020	2020-2025	2000-2025
Warehouse/Distribution	525	504	508	493	486	2,516
General Industrial	553	460	422	415	491	2,341
Tech/Flex	334	296	275	263	292	1,460
Nonindustrial Usage	353	315	301	293	317	1,579
Total New Acres	1,765	1,576	1,506	1,463	1,586	7,896

Note: Nonindustrial Usage Rate: 20%

Table A.8
Additional Industrial Land Needs in Acres by County, 2000 - 2025
Portland Metropolitan Area

	2000-2005	2005-2010	2010-2015	2015-2020	2020-2025	2000-2025
Multnomah	326	189	161	137	185	998
Washington	632	546	472	393	439	2,481
Clackamas	411	426	435	460	492	2,224
Clark	328	353	377	412	398	1,868
Yamhill	58	55	55	56	65	289
Columbia	10	7	5	7	7	36
Total	1,765	1,576	1,506	1,463	1,586	7,896

Hammer Siler George Associates
6/10/99

Table A.9
Industrial Workers as Percent of Sectoral Employment
Portland Metropolitan Area

Sector	Percent of Industrial Workers
Construction	25%
Manufacturing	100% *
TCU	
Trucking and Warehousing	100%
Water Transportation	100%
Air Transportation	100%
Communication	50%
Electric, Gas & Sanitation Services	50%
Wholesale	100% *
Services	
Computer and Data Processing Services	100%
Auto Repair, Services and Parking	100%
Miscellaneous Repair Services	100%

* less any administrative/auxillary workers

Sources: U.S. Census Bureau, *County Business Patterns*; Hammer Siler George Associates

Table A.10
Distribution of Industrial Workers to Building Type
Portland Metropolitan Area

	Warehouse/ Distribution	General Industrial	Tech/ Flex	Total
Mining/Construction		75%	25%	100%
Manufacturing		75%	25%	100%
TCU				
Trucking & Warehousing	100%			100%
Water Transportation	100%			100%
Air Transportation	100%			100%
Communications		50%	50%	100%
Electric, Gas, Sanitation		50%	50%	100%
Wholesale	90%		10%	100%
Services				
Computer & Data Processing			100%	100%
Auto Repair, Services, Parking		100%		100%
Miscellaneous Repair Services		75%	25%	100%

Source: Hammer Siler George Associates

Table A.11
Sensitivity Analysis of Industrial Land Needs in the Portland Metropolitan Area, 2000 - 2025

Alternative Development Scenarios	Occupied Square Feet per Employee			A: Baseline	B: Densification	C: Current Port of Portland Occupants	D: Colorado Springs
				Floor Area Ratios			
	W/D			0.33	0.363	0.223	0.20
		GI		0.30	0.330	0.223	0.20
			T/F	0.22	0.264	0.223	0.20
1: Baseline	1,100	550	450	7, 896 acres	7,040 acres	10,392 acres	11,587 acres
2: Recent Portland Industrial Activity	1,697	601	440	9,834 acres	8,805 acres	13,243 acres	14,766 acres
3: Current Port of Portland Occupants	1,389	694	568	9,967 acres	8,887 acres	13,117 acres	14,626 acres
4: Existing Portland Industrial Space	993	421	495	7, 087 acres	6,290 acres	9,195 acres	10,253 acres
5: Seattle Area Study	1,121	594	594	8,774 acres	7,794 acres	11,371 acres	12,679 acres

W/D = Warehouse/Distribution space
GI = General Industrial space
T/F = Tech/Flex space

Note: Industrial acres required under varying assumptions of square feet per employee and floor area ratios as described on the following page.

Table A.11 (cont'd.)
Sensitivity Analysis of Industrial Land Needs in the Portland Metropolitan Area

Scenarios Applied in the Sensitivity Analysis

The acreage needs shown in Table A.11 result from combining different assumptions about employee density and floor-area ratios.

The following cases were applied to consider alternative floor-area ratios.

Case A: Baseline scenario: HSGA recommendations, based on industrial employment in the Portland metropolitan area and various national and regional sources, including those presented here.
Case B: Densification scenario: illustrative of potential public policies developed to encourage densification. Based on a 10 percent densification of Warehouse/Distribution and General Industrial FARs, and 20 percent densification of Tech/Flex FAR applied in the baseline scenario.
Case C: Based on current occupants (owners and lessees) of land in the industrial parks operated by the Port of Portland, excluding certain atypical locations with excess outdoor storage.
Case D: Comparable data for industrial land developed since 1990 in Colorado Springs, as compiled from the El Paso County Assessor's database.

The following cases were applied to consider alternative employee densities:

Case 1: Baseline scenario: HSGA recommendations, based on industrial employment in the Portland metropolitan area and various national and regional sources, including those presented here.
Case 2: Based on Port of Portland data regarding new buildings and expansions added to the region in 1997 and 1998.
Case 3: Based on current occupants (owners and lessees) of land in the industrial parks operated by the Port of Portland, excluding certain atypical locations with excess outdoor storage.
Case 4: Based on a comparison of CB/Richard Ellis' inventory of existing industrial space in the greater Portland real estate market and RLIS estimates of buildings under 10,000 square feet, and HSGA's current estimates of industrial employees by building type.
Case 5: Comparable data for the Seattle region, as compiled in 1997 by the Puget Sound Regional Council from business surveys.

Table B.1
Sectoral Employment and Population, 1990 - 2025
Multnomah County

	1990	1995	1998	2000	2005	2010	2015	2020	2025
Total Nonfarm Employment	453,480	491,910	528,354	541,383	574,258	597,799	617,708	636,634	653,476
Construction and Mining	20,753	22,930	26,762	27,286	28,167	28,067	27,789	26,702	26,080
Manufacturing	53,123	53,620	54,048	54,804	56,350	56,668	56,700	56,433	56,780
TCPU	31,349	35,530	39,147	39,293	40,222	40,969	41,730	42,294	42,866
Wholesale	32,841	34,450	34,825	34,971	35,914	36,544	37,179	37,968	38,890
Retail	68,443	74,400	77,957	79,573	82,896	84,776	86,484	88,016	88,070
FIRE	41,947	43,350	46,782	48,019	50,257	51,774	53,293	54,686	55,860
Services	143,659	162,770	179,703	187,309	205,421	220,175	232,581	245,534	257,520
Other	61,365	64,860	69,130	70,128	75,031	78,826	81,952	85,001	87,410
Population	583,887	626,500	648,460	660,010	690,330	713,990	735,890	758,450	777,310

Annual Growth Rate

		1990-1995	1995-1998	1998-2000	2000-2005	2005-2010	2010-2015	2015-2020	2020-2025
Total Nonfarm Employment		1.6%	2.4%	1.2%	1.2%	0.8%	0.7%	0.6%	0.5%
Construction and Mining		2.0%	5.3%	1.0%	0.6%	-0.1%	-0.2%	-0.8%	-0.5%
Manufacturing		0.2%	0.3%	0.7%	0.6%	0.1%	0.0%	-0.1%	0.1%
TCPU		2.5%	3.3%	0.2%	0.5%	0.4%	0.4%	0.3%	0.3%
Wholesale		1.0%	0.4%	0.2%	0.5%	0.3%	0.3%	0.4%	0.5%
Retail		1.7%	1.6%	1.0%	0.8%	0.4%	0.4%	0.4%	0.0%
FIRE		0.7%	2.6%	1.3%	0.9%	0.6%	0.6%	0.5%	0.4%
Services		2.5%	3.4%	2.1%	1.9%	1.4%	1.1%	1.1%	1.0%
Other		1.1%	2.1%	0.7%	1.4%	1.0%	0.8%	0.7%	0.6%
Population		1.4%	1.2%	0.9%	0.9%	0.7%	0.6%	0.6%	0.5%

Note: "Other" includes federal, state and local government employees.
Source: Metro

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Table B.2
Industrial Employment, 1998 - 2025
Multnomah County

	Industrial Workers as Percent of Sectoral Employment *	1998	2000	2005	2010	2015	2020	2025
Total Industrial Employment		132,076	133,749	138,364	140,888	142,931	144,533	146,889
Construction and Mining	24.9%	6,662	6,793	7,012	6,987	6,918	6,647	6,492
Manufacturing	95.2%	51,446	52,166	53,638	53,940	53,971	53,716	54,047
TCU	71.3%	27,895	27,999	28,661	29,193	29,735	30,137	30,545
Trucking/Warehouse	34.2%	13,387	13,437	13,754	14,010	14,270	14,463	14,658
Water Transportation	7.0%	2,727	2,737	2,802	2,854	2,907	2,946	2,986
Air Transportation	15.1%	5,929	5,951	6,092	6,205	6,320	6,405	6,492
Communications	8.6%	3,383	3,396	3,476	3,541	3,607	3,655	3,705
Electricity, Gas, Sanitation	6.3%	2,469	2,478	2,537	2,584	2,632	2,667	2,703
Wholesale	92.8%	32,309	32,444	33,319	33,904	34,492	35,225	36,080
Services	7.7%	13,765	14,347	15,735	16,865	17,815	18,807	19,725
Computer, Data Processing	2.7%	4,916	5,124	5,620	6,023	6,363	6,717	7,045
Auto Repair, Service, Parking	3.5%	6,321	6,589	7,226	7,745	8,181	8,637	9,058
Miscellaneous Repair	1.4%	2,527	2,634	2,889	3,097	3,271	3,453	3,622

* Based on allocations shown in Table A.9

Table B.3
Distribution of Industrial Workers to Building Type
Multnomah County

Industrial Building Type	1998	2000	2005	2010	2015	2020	2025
Warehouse/Distribution	51,120	51,324	52,635	53,582	54,540	55,517	56,608
General Industrial	54,724	55,720	57,886	58,825	59,420	59,661	60,383
Tech/Flex	26,232	26,704	27,843	28,482	28,971	29,355	29,897
Total Industrial Workers	132,076	133,749	138,364	140,888	142,931	144,533	146,889

Note: Based on distribution of workers by building type as shown in Table A.10

Table B.4
Industrial Workers by Building Type Added During Period
Multnomah County

Industrial Building Type	2000-2005	2005-2010	2010-2015	2015-2020	2020-2025	2000-2025
Warehouse/Distribution	1,310	947	958	977	1,092	5,284
General Industrial	2,166	938	596	241	722	4,663
Tech/Flex	1,139	639	489	384	542	3,193
Total	4,615	2,524	2,043	1,601	2,356	13,140

Table B.5
Employment Density Factors
Multnomah County

	Occupied Sq Ft per Employee	Floor Area Ratio *	Employees per Acre
Warehouse/Distribution	1,100	0.33	13.07
General Industrial	550	0.30	23.76
Tech/Flex	450	0.22	21.30

* Square feet of building space divided by square feet of land

Table B.6
Additional Industrial Space in Square Feet Required by Building Type, 2000 - 2025
Multnomah County

	2000-2005	2005-2010	2010-2015	2015-2020	2020-2025	2000-2025
Warehouse/Distribution	1,533,300	1,108,200	1,121,400	1,142,900	1,277,700	6,183,500
General Industrial	1,267,300	549,000	348,500	140,800	422,700	2,728,300
Tech/Flex	545,200	306,000	234,200	183,800	259,600	1,528,800
Total	3,345,800	1,963,200	1,704,100	1,467,500	1,960,000	10,440,600

Note: Industrial Vacancy Rate: 6%

Table B.7
Additional Land Needs in Acres by Building Type, 2000 - 2025
Multnomah County

	2000-2005	2005-2010	2010-2015	2015-2020	2020-2025	2000-2025
Warehouse/Distribution	107	77	78	80	89	430
General Industrial	97	42	27	11	32	209
Tech/Flex	57	32	24	19	27	160
Nonindustrial Usage	65	38	32	27	37	200
Total New Acres	326	189	161	137	185	998

Note: Nonindustrial Usage Rate: 20%

Table C.1
Sectoral Employment and Population, 1990 - 2025
Washington County

	1990	1995	1998	2000	2005	2010	2015	2020	2025
Total Nonfarm Employment	174,391	223,850	255,849	271,919	308,262	342,204	373,536	400,211	425,863
Construction and Mining	10,972	14,790	18,504	19,580	21,726	23,128	24,300	24,510	25,250
Manufacturing	35,139	44,220	46,432	48,884	53,425	56,854	59,505	62,177	65,113
TCU	5,545	6,660	7,956	8,483	10,018	11,697	13,617	15,823	18,190
Wholesale	13,705	18,010	21,959	22,892	24,231	25,365	26,238	26,540	27,000
Retail	32,026	39,840	43,723	46,236	51,777	57,021	62,479	67,796	71,200
FIRE	12,478	16,120	17,690	18,953	22,427	25,941	29,516	32,973	36,330
Services	51,321	70,160	83,743	90,879	107,762	124,477	139,408	151,174	162,950
Other	13,205	14,050	15,843	16,011	16,897	17,721	18,474	19,217	19,830
Population	311,554	370,000	399,130	420,240	468,210	516,850	565,160	609,970	653,240

Annual Growth Rate

	1990-1995	1995-1998	1998-2000	2000-2005	2005-2010	2010-2015	2015-2020	2020-2025
Total Nonfarm Employment	5.1%	4.6%	3.1%	2.5%	2.1%	1.8%	1.4%	1.3%
Construction and Mining	6.2%	7.8%	2.9%	2.1%	1.3%	1.0%	0.2%	0.6%
Manufacturing	4.7%	1.6%	2.6%	1.8%	1.3%	0.9%	0.9%	0.9%
TCU	3.7%	6.1%	3.3%	3.4%	3.1%	3.1%	3.0%	2.8%
Wholesale	5.6%	6.8%	2.1%	1.1%	0.9%	0.7%	0.2%	0.3%
Retail	4.5%	3.1%	2.8%	2.3%	1.9%	1.8%	1.6%	1.0%
FIRE	5.3%	3.1%	3.5%	3.4%	3.0%	2.6%	2.2%	2.0%
Services	6.5%	6.1%	4.2%	3.5%	2.9%	2.3%	1.6%	1.5%
Other	1.2%	1.9%	0.7%	1.3%	1.2%	1.1%	1.1%	0.9%
Population	3.5%	2.6%	2.6%	2.2%	2.0%	1.8%	1.5%	1.4%

Note: "Other" includes federal, state and local government employees.
Source: Metro

Table C.2
Industrial Employment, 1998 - 2025
Washington County

	Industrial Workers as Percent of Sectoral Employment *	1998	2000	2005	2010	2015	2020	2025
Total Industrial Employment		87,353	92,192	101,628	109,665	116,536	122,366	128,836
Construction and Mining	24.5%	4,538	4,802	5,328	5,672	5,959	6,011	6,192
Manufacturing	96.6%	44,865	47,234	51,622	54,936	57,497	60,079	62,916
TCU	59.5%	4,733	5,047	5,960	6,959	8,101	9,413	10,822
Trucking/Warehouse	37.0%	2,945	3,140	3,708	4,330	5,040	5,857	6,733
Water Transportation	0.0%	0	0	0	0	0	0	0
Air Transportation	4.4%	352	375	443	517	602	700	805
Communications	12.2%	970	1,034	1,221	1,426	1,660	1,929	2,217
Electricity, Gas, Sanitation	5.9%	467	497	588	686	799	928	1,067
Wholesale	100.0%	21,959	22,892	24,231	25,365	26,238	26,540	27,000
Services	13.4%	11,258	12,217	14,487	16,734	18,741	20,323	21,906
Computer, Data Processing	8.5%	7,138	7,746	9,185	10,610	11,883	12,886	13,889
Auto Repair, Service, Parking	3.8%	3,154	3,423	4,059	4,689	5,251	5,695	6,138
Miscellaneous Repair	1.2%	965	1,048	1,242	1,435	1,607	1,743	1,879

* Based on allocations shown in Table A.9

Table C.3
Distribution of Industrial Workers to Building Type
Washington County

Industrial Building Type	1998	2000	2005	2010	2015	2020	2025
Warehouse/Distribution	23,060	24,118	25,959	27,676	29,256	30,443	31,838
General Industrial	41,649	44,002	48,608	52,277	55,278	57,997	61,020
Tech/Flex	22,644	24,072	27,061	29,713	32,001	33,926	35,978
Total Industrial Workers	87,353	92,192	101,628	109,665	116,536	122,366	128,836

Note: Based on distribution of workers by building type as shown in Table A.10

Table C.4
Industrial Workers by Building Type Added During Period
Washington County

Industrial Building Type	2000-2005	2005-2010	2010-2015	2015-2020	2020-2025	2000-2025
Warehouse/Distribution	1,841	1,717	1,581	1,187	1,394	7,720
General Industrial	4,606	3,668	3,001	2,719	3,023	17,018
Tech/Flex	2,989	2,652	2,288	1,925	2,052	11,906
Total	9,436	8,037	6,871	5,830	6,470	36,644

Table C.5
Employment Density Factors
Washington County

	Occupied Sq Ft per Employee	Floor Area Ratio *	Employees per Acre
Warehouse/Distribution	1,100	0.33	13.07
General Industrial	550	0.30	23.76
High Tech/Flex	450	0.22	21.30

* Square feet of building space divided by square feet of land

Table C.6
Additional Industrial Space in Square Feet Required by Building Type, 2000 - 2025
Washington County

	2000-2005	2005-2010	2010-2015	2015-2020	2020-2025	2000-2025
Warehouse/Distribution	2,154,400	2,008,900	1,849,900	1,388,500	1,631,800	9,033,600
General Industrial	2,695,100	2,146,400	1,756,100	1,591,000	1,768,900	9,957,500
Tech/Flex	1,430,800	1,269,700	1,095,500	921,400	982,300	5,699,600
Total	6,280,300	5,425,000	4,701,500	3,900,900	4,383,000	24,690,700

Note: Industrial Vacancy Rate: 6%

Table C.7
Additional Land Needs in Acres by Building Type, 2000 - 2025
Washington County

	2000-2005	2005-2010	2010-2015	2015-2020	2020-2025	2000-2025
Warehouse/Distribution	150	140	129	97	114	628
General Industrial	206	164	134	122	135	762
High Tech/Flex	149	132	114	96	103	595
Nonindustrial Usage	126	109	94	79	88	496
Total New Acres	632	546	472	393	439	2,481

Note: Nonindustrial Usage Rate: 20%

Table D.1
Sectoral Employment and Population, 1990 - 2025
Clackamas County

	1990	1995	1998	2000	2005	2010	2015	2020	2025
Total Nonfarm Employment	123,143	148,110	167,547	177,085	199,597	223,165	247,501	273,369	299,930
Construction and Mining	8,081	10,890	13,500	14,067	15,423	16,508	17,600	18,444	19,400
Manufacturing	16,951	18,290	19,736	20,774	22,807	24,688	26,484	28,470	31,100
TCU	4,438	5,370	6,526	6,923	7,935	9,025	10,243	11,606	13,000
Wholesale	10,173	12,960	15,873	16,776	18,567	20,576	22,638	24,733	26,680
Retail	25,909	29,940	32,994	35,039	39,390	44,381	49,853	55,621	60,560
FIRE	8,328	11,300	12,242	12,831	14,038	15,285	16,641	18,099	19,550
Services	34,796	44,650	51,077	54,985	65,150	75,907	86,861	98,871	111,890
Other	14,467	14,710	15,597	15,689	16,287	16,794	17,181	17,525	17,750
Population	278,850	308,600	324,620	335,070	358,820	386,430	413,250	439,760	464,280

Annual Growth Rate

	1990-1995	1995-1998	1998-2000	2000-2005	2005-2010	2010-2015	2015-2020	2020-2025
Total Nonfarm Employment	3.8%	4.2%	2.8%	2.4%	2.3%	2.1%	2.0%	1.9%
Construction and Mining	6.1%	7.4%	2.1%	1.9%	1.4%	1.3%	0.9%	1.0%
Manufacturing	1.5%	2.6%	2.6%	1.9%	1.6%	1.4%	1.5%	1.8%
TCU	3.9%	6.7%	3.0%	2.8%	2.6%	2.6%	2.5%	2.3%
Wholesale	5.0%	7.0%	2.8%	2.0%	2.1%	1.9%	1.8%	1.5%
Retail	2.9%	3.3%	3.1%	2.4%	2.4%	2.4%	2.2%	1.7%
FIRE	6.3%	2.7%	2.4%	1.8%	1.7%	1.7%	1.7%	1.6%
Services	5.1%	4.6%	3.8%	3.5%	3.1%	2.7%	2.6%	2.5%
Other	0.3%	1.8%	0.3%	0.8%	0.6%	0.5%	0.4%	0.3%
Population	2.0%	1.7%	1.6%	1.4%	1.5%	1.4%	1.3%	1.1%

Note: "Other" includes federal, state and local government employees.
Source: Metro

Table D-2
Industrial Employment, 1998 - 2025
Clackamas County

	Industrial Workers as Percent of Sectoral Employment *	1998	2000	2005	2010	2015	2020	2025
Total Industrial Employment		46,264	48,868	54,424	60,067	65,776	71,828	78,519
Construction and Mining	24.8%	3,344	3,484	3,820	4,089	4,359	4,568	4,805
Manufacturing	98.8%	19,500	20,526	22,535	24,393	26,167	28,130	30,728
TCU	63.7%	4,159	4,412	5,057	5,752	6,528	7,396	8,285
Trucking/Warehouse	52.5%	3,426	3,634	4,166	4,738	5,378	6,093	6,825
Water Transportation	0.0%	0	0	0	0	0	0	0
Air Transportation	0.0%	0	0	0	0	0	0	0
Communications	5.4%	352	373	428	486	552	625	701
Electricity, Gas, Sanitation	5.8%	381	404	463	527	598	678	759
Wholesale	92.6%	14,698	15,535	17,193	19,053	20,963	22,903	24,706
Services	8.9%	4,562	4,912	5,820	6,780	7,759	8,832	9,995
Computer, Data Processing	3.4%	1,720	1,852	2,194	2,556	2,925	3,329	3,768
Auto Repair, Service, Parking	4.0%	2,053	2,210	2,619	3,051	3,492	3,974	4,498
Miscellaneous Repair	1.5%	789	850	1,007	1,173	1,342	1,528	1,729

* Based on allocations shown in Table A.9

Table D.3
Distribution of Industrial Workers to Building Type
Clackamas County

Industrial Building Type	1998	2000	2005	2010	2015	2020	2025
Warehouse/Distribution	16,655	17,616	19,640	21,886	24,244	26,706	29,060
General Industrial	20,144	21,244	23,586	25,799	27,968	30,295	33,174
Tech/Flex	9,465	10,009	11,199	12,382	13,564	14,828	16,284
Total Industrial Workers	46,264	48,868	54,424	60,067	65,776	71,828	78,519

Note: Based on distribution of workers by building type as shown in Table A.10

Table D.4
Industrial Workers by Building Type Added During Period
Clackamas County

Industrial Building Type	2000-2005	2005-2010	2010-2015	2015-2020	2020-2025	2000-2025
Warehouse/Distribution	2,024	2,247	2,358	2,461	2,355	11,445
General Industrial	2,342	2,214	2,169	2,327	2,879	11,930
Tech/Flex	1,190	1,183	1,182	1,264	1,456	6,275
Total	5,556	5,643	5,709	6,053	6,690	29,650

Table D.5
Employment Density Factors
Clackamas County

	Occupied Sq Ft per Employee	Floor Area Ratio *	Employees per Acre
Warehouse/Distribution	1,100	0.33	13.07
General Industrial	550	0.30	23.76
Tech/Flex	450	0.22	21.30

* Square feet of building space divided by square feet of land

Table D.6
Additional Industrial Space in Square Feet Required by Building Type, 2000 - 2025
Clackamas County

	2000-2005	2005-2010	2010-2015	2015-2020	2020-2025	2000-2025
Warehouse/Distribution	2,368,600	2,629,000	2,759,400	2,880,300	2,755,700	13,392,900
General Industrial	1,370,100	1,295,300	1,269,000	1,361,500	1,684,600	6,980,500
Tech/Flex	569,800	566,300	565,700	605,200	697,100	3,004,100
Total	4,308,500	4,490,600	4,594,100	4,847,000	5,137,400	23,377,500

Note: Industrial Vacancy Rate: 6%

Table D.7
Additional Land Needs in Acres by Building Type, 2000 - 2025
Clackamas County

	2000-2005	2005-2010	2010-2015	2015-2020	2020-2025	2000-2025
Warehouse/Distribution	165	183	192	200	192	932
General Industrial	105	99	97	104	129	534
Tech/Flex	59	59	59	63	73	313
Nonindustrial Usage	82	85	87	92	98	445
Total New Acres	411	426	435	460	492	2,224

Note: Nonindustrial Usage Rate: 20%

Table E.1
Sectoral Employment and Population, 1990 - 2025
Clark County

	1990	1995	1998	2000	2005	2010	2015	2020	2025
Total Nonfarm Employment	104,890	131,820	148,828	158,184	181,863	207,368	234,900	265,299	295,460
Construction and Mining	8,960	12,750	15,802	17,162	20,349	23,629	27,192	30,334	33,870
Manufacturing	17,850	20,890	21,370	22,131	24,309	26,739	29,347	32,355	35,480
TCU	4,120	5,530	6,588	6,809	7,175	7,577	7,994	8,344	8,580
Wholesale	3,720	5,320	6,413	6,841	7,870	8,931	10,053	11,297	12,290
Retail	18,440	23,470	26,620	28,418	32,700	37,198	42,112	47,398	51,140
FIRE	8,180	9,540	10,592	11,286	13,016	15,008	17,186	19,543	22,000
Services	28,000	36,560	42,135	45,404	54,421	64,491	75,312	88,234	102,160
Other	15,620	17,760	19,307	20,133	22,021	23,794	25,702	27,794	29,940
Population	238,050	291,000	320,060	335,620	375,320	420,380	466,540	514,540	559,920

Annual Growth Rate

	1990-1995	1995-1998	1998-2000	2000-2005	2005-2010	2010-2015	2015-2020	2020-2025
Total Nonfarm Employment	4.7%	4.1%	3.1%	2.8%	2.7%	2.5%	2.5%	2.2%
Construction and Mining	7.3%	7.4%	4.2%	3.5%	3.0%	2.8%	2.2%	2.2%
Manufacturing	3.2%	0.8%	1.8%	1.9%	1.9%	1.9%	2.0%	1.9%
TCU	6.1%	6.0%	1.7%	1.1%	1.1%	1.1%	0.9%	0.6%
Wholesale	7.4%	6.4%	3.3%	2.8%	2.6%	2.4%	2.4%	1.7%
Retail	4.9%	4.3%	3.3%	2.8%	2.6%	2.5%	2.4%	1.5%
FIRE	3.1%	3.5%	3.2%	2.9%	2.9%	2.7%	2.6%	2.4%
Services	5.5%	4.8%	3.8%	3.7%	3.5%	3.2%	3.2%	3.0%
Other	2.6%	2.8%	2.1%	1.8%	1.6%	1.6%	1.6%	1.5%
Population	4.1%	3.2%	2.4%	2.3%	2.3%	2.1%	2.0%	1.7%

Note: "Other" includes federal, state and local government workers.
Source: Metro

Table E.2
Industrial Employment, 1998 - 2025
Clark County

	Industrial Workers as Percent of Sectoral Employment *	1998	2000	2005	2010	2015	2020	2025
Total Industrial Employment		38,524	40,415	45,271	50,535	56,172	62,342	68,487
Construction and Mining	24.2%	3,824	4,153	4,924	5,718	6,580	7,340	8,196
Manufacturing	98.3%	20,999	21,747	23,887	26,275	28,838	31,794	34,864
TCU	62.6%	4,126	4,264	4,493	4,745	5,006	5,226	5,373
Trucking/Warehouse	37.8%	2,493	2,576	2,715	2,867	3,025	3,157	3,246
Water Transportation	5.6%	369	381	401	424	447	467	480
Air Transportation	0.0%	0	0	0	0	0	0	0
Communications	17.8%	1,170	1,209	1,274	1,345	1,419	1,482	1,524
Electricity, Gas, Sanitation	1.4%	94	98	103	109	115	120	123
Wholesale	97.1%	6,224	6,640	7,638	8,668	9,757	10,964	11,928
Services	8.0%	3,351	3,611	4,329	5,130	5,990	7,018	8,126
Computer, Data Processing	2.6%	1,113	1,200	1,438	1,704	1,990	2,331	2,699
Auto Repair, Service, Parking	4.0%	1,688	1,819	2,180	2,584	3,017	3,535	4,093
Miscellaneous Repair	1.3%	550	593	710	842	983	1,152	1,334

* Based on allocations shown in Table A.9

Table E.3
Distribution of Industrial Workers to Building Type
Clark County

Industrial Building Type	1998	2000	2005	2010	2015	2020	2025
Warehouse/Distribution	8,463	8,933	9,991	11,092	12,254	13,492	14,462
General Industrial	21,350	22,342	25,010	27,937	31,085	34,550	38,211
Tech/Flex	8,711	9,140	10,271	11,506	12,833	14,300	15,814
Total Industrial Workers	38,524	40,415	45,271	50,535	56,172	62,342	68,487

Note: Based on distribution of workers by building type as shown in Table A.10

Table E.4
Industrial Workers by Building Type Added During Period
Clark County

Industrial Building Type	2000-2005	2005-2010	2010-2015	2015-2020	2020-2025	2000-2025
Warehouse/Distribution	1,058	1,101	1,161	1,238	970	5,529
General Industrial	2,668	2,927	3,148	3,465	3,662	15,870
Tech/Flex	1,131	1,236	1,326	1,467	1,514	6,674
Total	4,857	5,264	5,636	6,170	6,145	28,072

Table E.5
Employment Density Factors
Clark County

	Occupied Sq Ft per Employee	Floor Area Ratio *	Employees per Acre
Warehouse/Distribution	1,100	0.33	13.07
General Industrial	550	0.30	23.76
Tech/Flex	450	0.22	21.30

* Square feet of building space divided by square feet of land

Table E.6
Additional Industrial Space in Square Feet Required by Building Type, 2000 - 2025
Clark County

	2000-2005	2005-2010	2010-2015	2015-2020	2020-2025	2000-2025
Warehouse/Distribution	1,238,000	1,288,700	1,359,200	1,449,300	1,134,800	6,470,000
General Industrial	1,561,100	1,712,600	1,842,100	2,027,200	2,142,400	9,285,400
Tech/Flex	541,200	591,700	635,000	702,200	724,700	3,194,800
Total	3,340,300	3,593,000	3,836,300	4,178,700	4,001,900	18,950,200

Note: Industrial Vacancy Rate: 6%

Table E.7
Additional Land Needs in Acres by Building Type, 2000 - 2025
Clark County

	2000-2005	2005-2010	2010-2015	2015-2020	2020-2025	2000-2025
Warehouse/Distribution	86	90	95	101	79	450
General Industrial	119	131	141	155	164	711
Tech/Flex	56	62	66	73	76	333
Nonindustrial Usage	66	71	75	82	80	374
Total New Acres	328	353	377	412	398	1,868

Note: Nonindustrial Usage Rate: 20%

Table F.1
Sectoral Employment and Population, 1990 - 2025
Yamhill County

	1990	1995	1998	2000	2005	2010	2015	2020	2025
Total Nonfarm Employment	26,590	32,140	35,510	37,000	39,930	43,890	48,000	52,290	56,580
Construction and Mining	940	1,260	1,460	1,610	1,860	2,070	2,280	2,430	2,660
Manufacturing	5,440	5,950	6,330	6,640	7,190	7,740	8,280	8,830	9,570
TCU	670	820	730	820	960	1,050	1,140	1,230	1,340
Wholesale	591	745	844	868	942	1,018	1,099	1,180	1,222
Retail	3,789	4,775	5,406	5,562	6,038	6,522	7,041	7,560	7,828
FIRE	820	1,060	1,130	1,130	1,070	1,130	1,200	1,260	1,320
Services	4,710	6,850	8,410	8,890	10,120	11,560	13,120	14,840	16,470
Other	9,630	10,680	11,200	11,480	11,750	12,800	13,840	14,960	16,170
Population	65,550	74,600	80,950	84,250	91,250	99,880	108,710	117,700	126,190

Annual Growth Rate

	1990-1995	1995-1998	1998-2000	2000-2005	2005-2010	2010-2015	2015-2020	2020-2025
Total Nonfarm Employment	3.9%	3.4%	2.1%	1.5%	1.9%	1.8%	1.7%	1.6%
Construction and Mining	6.0%	5.0%	5.0%	2.9%	2.2%	2.0%	1.3%	1.8%
Manufacturing	1.8%	2.1%	2.4%	1.6%	1.5%	1.4%	1.3%	1.6%
TCU	4.1%	-3.8%	6.0%	3.2%	1.8%	1.7%	1.5%	1.7%
Wholesale	4.7%	4.2%	1.4%	1.7%	1.6%	1.5%	1.4%	0.7%
Retail	4.7%	4.2%	1.4%	1.7%	1.6%	1.5%	1.4%	0.7%
FIRE	5.3%	2.2%	0.0%	-1.1%	1.1%	1.2%	1.0%	0.9%
Services	7.8%	7.1%	2.8%	2.6%	2.7%	2.6%	2.5%	2.1%
Other	2.1%	1.6%	1.2%	0.5%	1.7%	1.6%	1.6%	1.6%
Population	2.6%	2.8%	2.0%	1.6%	1.8%	1.7%	1.6%	1.4%

Note: "Other" includes proprietors, federal, state and local government employees.
Source: Metro

Table F.2
Industrial Employment, 1998 - 2025
Yamhill County

	Industrial Workers as Percent of Sectoral Employment *	1998	2000	2005	2010	2015	2020	2025
Total Industrial Employment		8,675	9,149	10,027	10,873	11,722	12,579	13,614
Construction and Mining	23.7%	346	381	441	490	540	576	630
Manufacturing	100.0%	6,330	6,640	7,190	7,740	8,280	8,830	9,570
TCU	78.2%	571	641	751	821	892	962	1,048
Trucking/Warehouse	22.3%	163	183	214	234	254	274	299
Water Transportation	0.0%	0	0	0	0	0	0	0
Air Transportation	50.3%	367	412	483	528	573	618	674
Communications	5.7%	41	46	54	59	64	70	76
Electricity, Gas, Sanitation	0.0%	0	0	0	0	0	0	0
Wholesale	100.0%	844	868	942	1,018	1,099	1,180	1,222
Services	6.9%	584	618	703	803	912	1,031	1,144
Computer, Data Processing	2.9%	244	258	293	335	380	430	478
Auto Repair, Service, Parking	3.1%	265	280	319	364	413	467	519
Miscellaneous Repair	0.9%	76	80	91	104	118	134	148

* Based on allocations shown in Table A.9

Table F.3
Distribution of Industrial Workers to Building Type
Yamhill County

Industrial Building Type	1998	2000	2005	2010	2015	2020	2025
Warehouse/Distribution	1,289	1,376	1,545	1,678	1,816	1,954	2,072
General Industrial	5,349	5,629	6,137	6,645	7,149	7,657	8,318
Tech/Flex	2,037	2,143	2,345	2,550	2,757	2,968	3,225
Total Industrial Workers	8,675	9,149	10,027	10,873	11,722	12,579	13,614

Note: Based on distribution of workers by building type as shown in Table A.10

Table F.4
Industrial Workers by Building Type Added During Period
Yamhill County

Industrial Building Type	2000-2005	2005-2010	2010-2015	2015-2020	2020-2025	2000-2025
Warehouse/Distribution	168	133	138	138	117	696
General Industrial	508	507	505	507	661	2,689
Tech/Flex	202	205	207	211	257	1,082
Total	878	846	850	856	1,036	4,466

Table F.5
Employment Density Factors
Yamhill County

	Occupied Sq Ft per Employee	Floor Area Ratio *	Employees per Acre
Warehouse/Distribution	1,100	0.33	13.07
General Industrial	550	0.30	23.76
Tech/Flex	450	0.22	21.30

* Square feet of building space divided by square feet of land

Table F.6
Additional Industrial Space in Square Feet Required by Building Type, 2000 - 2025
Yamhill County

	2000-2005	2005-2010	2010-2015	2015-2020	2020-2025	2000-2025
Warehouse/Distribution	197,100	156,000	161,700	161,700	137,500	814,000
General Industrial	297,200	296,900	295,200	296,900	386,900	1,573,100
Tech/Flex	96,800	98,200	99,000	100,900	123,000	517,800
Total	591,100	551,100	555,900	559,500	647,400	2,904,900

Note: Industrial Vacancy Rate: 6%

Table F.7
Additional Land Needs in Acres by Building Type, 2000 - 2025
Yamhill County

	2000-2005	2005-2010	2010-2015	2015-2020	2020-2025	2000-2025
Warehouse/Distribution	14	11	11	11	10	57
General Industrial	23	23	23	23	30	120
Tech/Flex	10	10	10	11	13	54
Nonindustrial Usage	12	11	11	11	13	58
Total New Acres	58	55	55	56	65	289

Note: Nonindustrial Usage Rate: 20%

Table G.1
Sectoral Employment and Population, 1990 - 2025
Columbia County

	1990	1995	1998	2000	2005	2010	2015	2020	2025
Total Nonfarm Employment	12,430	12,510	14,010	14,590	16,200	17,260	18,410	19,600	20,800
Construction and Mining	470	500	530	550	560	560	570	560	560
Manufacturing	2,390	2,240	2,310	2,370	2,440	2,450	2,420	2,400	2,400
TCU	1,380	650	770	830	920	1,020	1,120	1,240	1,350
Wholesale	153	162	184	190	201	211	221	230	233
Retail	1,647	1,748	1,976	2,050	2,169	2,269	2,379	2,471	2,507
FIRE	310	380	410	430	470	510	550	590	630
Services	1,420	1,460	1,660	1,740	1,890	2,040	2,220	2,420	2,630
Other	4,660	5,370	6,170	6,430	7,550	8,200	8,930	9,690	10,490
Population	37,560	39,700	40,860	41,390	42,180	43,660	45,390	47,100	48,770

Annual Growth Rate

	1990-1995	1995-1998	1998-2000	2000-2005	2005-2010	2010-2015	2015-2020	2020-2025
Total Nonfarm Employment	0.1%	3.8%	2.0%	2.1%	1.3%	1.3%	1.3%	1.2%
Construction and Mining	1.2%	2.0%	1.9%	0.4%	0.0%	0.4%	-0.4%	0.0%
Manufacturing	-1.3%	1.0%	1.3%	0.6%	0.1%	-0.2%	-0.2%	0.0%
TCU	-14.0%	5.8%	3.8%	2.1%	2.1%	1.9%	2.1%	1.7%
Wholesale	1.2%	4.2%	1.8%	1.1%	0.9%	0.9%	0.8%	0.3%
Retail	1.2%	4.2%	1.8%	1.1%	0.9%	0.9%	0.8%	0.3%
FIRE	4.2%	2.6%	2.4%	1.8%	1.6%	1.5%	1.4%	1.3%
Services	0.6%	4.4%	2.4%	1.7%	1.5%	1.7%	1.7%	1.7%
Other	2.9%	4.7%	2.1%	3.3%	1.7%	1.7%	1.6%	1.6%
Population	1.1%	1.0%	0.6%	0.4%	0.7%	0.8%	0.7%	0.7%

Note: "Other" equals proprietors, federal, state and local government workers.
Source: Metro

Table G-2
Industrial Employment, 1998 - 2025
Columbia County

	Industrial Workers as Percent of Sectoral Employment *	1998	2000	2005	2010	2015	2020	2025
Total Industrial Employment		3,174	3,286	3,433	3,522	3,576	3,647	3,730
Construction and Mining	20.6%	109	114	116	116	118	116	116
Manufacturing	100.0%	2,310	2,370	2,440	2,450	2,420	2,400	2,400
TCU	59.3%	457	492	546	605	664	735	801
Trucking/Warehouse	38.6%	297	320	355	393	432	478	521
Water Transportation	0.0%	0	0	0	0	0	0	0
Air Transportation	0.0%	0	0	0	0	0	0	0
Communications	0.0%	0	0	0	0	0	0	0
Electricity, Gas, Sanitation	20.7%	160	172	191	211	232	257	280
Wholesale	100.0%	184	190	201	211	221	230	233
Services	6.9%	115	120	130	141	153	167	181
Computer, Data Processing	2.9%	48	50	55	59	64	70	76
Auto Repair, Service, Parking	3.1%	51	54	59	63	69	75	82
Miscellaneous Repair	0.9%	15	16	17	18	20	22	24

* Based on allocations shown in Table A.9

Table G.3
Distribution of Industrial Workers to Building Type
Columbia County

Industrial Building Type	1998	2000	2005	2010	2015	2020	2025
Warehouse/Distribution	462	491	536	583	631	685	730
General Industrial	1,957	2,014	2,083	2,107	2,103	2,107	2,126
Tech/Flex	755	780	813	832	842	856	874
Total Industrial Workers	3,174	3,286	3,433	3,522	3,576	3,647	3,730

Note: Based on distribution of workers by building type as shown in Table A.10

Table G.4
Industrial Workers by Building Type Added During Period
Columbia County

Industrial Building Type	2000-2005	2005-2010	2010-2015	2015-2020	2020-2025	2000-2025
Warehouse/Distribution	45	47	48	54	45	239
General Industrial	69	24	-4	3	19	112
Tech/Flex	33	18	10	14	18	94
Total	147	89	54	71	83	444

Table G.5
Employment Density Factors
Columbia County

	Occupied Sq Ft per Employee	Floor Area Ratio *	Employees per Acre
Warehouse/Distribution	1,100	0.33	13.07
General Industrial	550	0.30	23.76
High Tech/Flex	450	0.22	21.30

* Square feet of building space divided by square feet of land

Table G-6
Additional Industrial Space in Square Feet Required by Building Type, 2000 - 2025
Columbia County

	2000-2005	2005-2010	2010-2015	2015-2020	2020-2025	2000-2025
Warehouse/Distribution	52,200	55,000	55,900	63,100	53,200	279,500
General Industrial	40,400	13,800	-2,200	2,000	11,300	65,300
Tech/Flex	15,900	8,800	4,800	6,700	8,800	45,000
Total	108,500	77,600	58,500	71,800	73,300	389,700

Note: Industrial Vacancy Rate: 6%

Table G-7
Additional Land Needs in Acres by Building Type, 2000 - 2025
Columbia County

	2000-2005	2005-2010	2010-2015	2015-2020	2020-2025	2000-2025
Warehouse/Distribution	4	4	4	4	4	19
General Industrial	3	1	0	0	1	5
Tech/Flex	2	1	1	1	1	5
Nonindustrial Usage	2	1	1	1	1	7
Total New Acres	10	7	5	7	7	36

Note: Nonindustrial Usage Rate: 20%

Appendix B -- GIS Data Sources

Table 1
Available Geographic Information System Data
Regional Industrial Lands Study
As of January 28, 1999

	Washington. Co. West	Washington. Co. East	Clackamas. Co. Urban	Clackamas. Co. Rural	Multnomah Co. West	Multnomah Co. East	Clark Co.	Yamhill (Newberg)	Marion Co. (Woodburn)	Columbia Co. (St. Helens/Scappoose)	Metro Boundary	Molalla	Milwaukie (Happy Valley)	Canby	Sandy	Estacada
Parcel/Tax lot	●	●	●	n/a	●	n/a	●	●	●	n/a	●	●	●	●	●	●
Orthophoto	n/a	●	●	n/a	●	n/a	●	●	n/a	n/a	●	n/a	n/a	●	●	n/a
Comp. Plan	●	●	●	n/a	●	n/a	●	●	n/a	n/a	●	●	●	●	●	●
Easements	n/a	n/a	n/a	n/a	n/a	n/a	●	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Overlay Restriction	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Wetland	n/a	●	●	n/a	●	n/a	●	n/a	n/a	n/a	●	n/a	●	●	●	●
Floodplain	n/a	●	●	n/a	●	n/a	●	n/a	n/a	n/a	●	n/a	●	●	●	●
Water Quality	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Hazardous Materials	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Slopes	n/a	●	●	n/a	●	n/a	●	n/a	n/a	n/a	●	n/a	●	●	n/a	●
Topo	●	●	●	n/a	●	n/a	●	●	n/a	n/a	●	n/a	●	●	●	●
Assessor	n/a	●	●	n/a	●	n/a	●	●	n/a	n/a	●	n/a	●	●	●	●
Water/Storm Line	n/a	n/a	n/a	n/a	n/a	n/a	●	●	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Electric Line	n/a	n/a	n/a	n/a	n/a	n/a	●	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Sewer Line	n/a	n/a	n/a	n/a	n/a	n/a	●	●	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Fiber Optics	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Fire Stations	n/a	●	●	n/a	●	n/a	Dist.	n/a	n/a	n/a	●	●	●	●	●	●
Parks	●	●	●	n/a	●	n/a	●	●	n/a	n/a	●	n/a	●	●	●	●
Schools	n/a	●	●	n/a	●	n/a	●	●	n/a	n/a	●	●	●	●	●	●
Jails	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Undeveloped	●	●	●	n/a	●	n/a	●	●	n/a	n/a	●	n/a	●	n/a	●	n/a
Exception Lands	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Industrial Sanctuary	●	●	●	n/a	●	n/a	n/a	n/a	n/a	n/a	●	n/a	n/a	n/a	n/a	n/a
Farm Tax Deferral	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Env. Cleanup Sites	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Title 3	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	●	n/a	n/a	n/a	n/a	n/a
Habitat	n/a	n/a	n/a	n/a	n/a	n/a	●	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Hydric Soils	n/a	●	●	n/a	●	n/a	●	n/a	n/a	n/a	●	●	●	●	●	●

Definitions

n/a = not available
● = available

Appendix C -- Industrial Supply Outside Metro UGB

Table C-1: Industrial Supply Outside Portland Metro UGB (excludes Clark County)

Clackamas County	Gross Vacant Land (Tiers B & C)	Redevelopment Land (Tier D)	Total Gross Acres	Acres Deducted Due to Env. Constraints[1]	Acres Deducted Due to Public Use & Other Constraints[2]	Net Buildable Acres	Vacant Net Buildable[3]	Redevelopable Net Buildable (Tier D)
Estacada	36	5	36	13	6	17	15	2
Molalla	--	45	45	16	8	21	0	21
Sandy	51	21	72	25	13	34	24	10
Canby	176	229	405	142	71	192	84	109
Subtotal	**263**	**300**	**558**	**195**	**98**	**265**	**122**	**142**
Washington County								
North Plains	39	2	39	14	7	19	18	1
Banks	9	5	9	3	2	4	2	2
Rural Reserves	190	21	211	74	37	100	90	10
Subtotal	**238**	**28**	**266**	**91**	**45**	**123**	**110**	**13**
Yamhill County								
Newberg	**150**	**10**	**160**	**56**	**27**	**77**	**72**	**5**
McMinville	**257**	**- -**	**257**	**90**	**44**	**123**	**123**	**- -**
Sheridan	**90**	**- -**	**90**	**32**	**15**	**43**	**43**	**- -**
Columbia County								
Clatskanie	800	0	800	280	140	380	380	0
Ranier	150	0	150	53	26	71	71	0
Vernonia	100	0	100	35	18	47	47	0
Columbia City	200	100	300	105	53	142	95	47
St. Helens	125	330	455	159	80	216	59	157
Scappose	15	40	55	19	10	26	7	19
Subtotal	**1,390**	**470**	**1,860**	**651**	**326**	**883**	**660**	**223**
Grand Total	**2,388**	**808**	**3,191**	**1,115**	**555**	**1,514**	**1,130**	**383**

Notes:
Environmental constraints adjustment factor: 35% *
Public use/other constraints adjustment factor: 17% **

[1] Environmental constraints include slopes, floodplains, wetlands, and riparian areas.

[2] Public use/other constraints reflect land for future public facilities, such as streets, parks, utility easements, and other public facilities.

[3] Land is considered to be Tier B with exception of approximately 70 acres in Rainier (James River Site).*Source: Compiled by Otak, Inc. based on available GIS data, interviews, and Metro Urban Growth Report Addendum, 1998.*

Table C-2: Net Buildable Industrial Acres by Tier
Clark County

	Tier A	Tier B	Tier C	Tier D	Total
Vancouver	260	537	37	13	848
Camas	345	261	1	29	637
Washougal	144	5	3	17	169
Ridgefield	275	161	3	4	442
Battleground	-	71	2	38	110
Other Clark Co.	321	128	26	189	664
Total	**1,345**	**1,163**	**71**	**290**	**2,869**

Source: Otak, Inc. based on Clark County GIS data and interviews.

Appendix D -- Metro UGB Analysis

Appendix D — Metro UGB Industrial Land Needs Analysis

Portland Metro UGB Industrial Land Supply

Table D-1 indicates how the buildable industrial land inventory is allocated by subarea. The Portland Metro Planning Boundary (excluding urban reserves which have not yet been zoned) includes approximately 4,815 buildable acres of supply in all tiers. Based on the existing industrial land inventory, 90 percent of the industrial land in Multnomah, Washington, and Clackamas counties is within the Metro UGB, and 10 percent is in small communities outside the Metro UGB, such as Canby and Sandy, or rural exception lands. Please refer to Appendix C for a breakdown of supply by community outside the Metro UGB.

Table D-1: Industrial Land Inventory
Metro UGB

Gross Acres after Environmental Constraints [1]					
	Tier A	**Tier B**	**Tier C**	**Tier D**	**Total**
Clackamas	65	724	0	73	862
Multnomah	605	2685	102	252	3,644
Washington	661	1500	30	121	2,312
Total	**1,331**	**4,909**	**132**	**446**	**6,818**
Net Buildable Acres After Public Use/Other Constraints [2]					
	Tier A	**Tier B**	**Tier C [3]**	**Tier D [4]**	**Total**
Clackamas	47	529	-	24	600
Multnomah	442	1,960	87	83	2,572
Washington	483	1,095	26	40	1,643
Total	**972**	**3,584**	**112**	**147**	**4,815**
Gross: Net Factors:	*73%*	*73%*	*85%*	*33%*	

Notes:

[1] Derived from Metro RLIS database using methodology shown.

[2] Gross: net adjustment factors for tiers A & B derived from Metro Urban Growth Report Addendum, August 26, 1998.

[3] Tier C net: gross adjustment factor assumption by Otak, Inc.

[4] Tier D adjustment reflects property/owner participation assumption.

Source: compiled by Otak, Inc. based primarily on Metro RLIS and Urban Growth Report Addendum, August 26, 1998.

Analysis of Tier B Lands

The majority of buildable industrial lands are classified as Tier B — with development constraints. As indicated in Table D-2, Tier B lands represent 1,163 net buildable acres of 72 percent of the Metro UGB's buildable industrial land inventory. To better understand Tier B land constraints, an analysis was conducted for the Metro UGB. As reflected in Table D-2, the major development constraints are attributed to: corporate ownership or lease-only provisions (38 percent); earthquake hazards/soil conditions (35 percent); transportation constraints (15 percent); and marine/aviation use restrictions (12 percent). As noted in Table D-2, development constraints vary by county.

Table D-2: Analysis of Tier B Vacant Industrial Lands
Metro UGB (Gross Buildable Acres)

County	**Multnomah**		**Washington**		**Clackamas**		**Metro UGB**	
Primary Constraint	*Acres*	*%*	*Acres*	*%*	*Acres*	*%*	*Acres*	*%*
Transportation [1]	377	14%	13	1%	323	45%	713	15%
Corporate Ownership/Lease [2]	834	31%	695	46%	362	50%	1,891	38%
Marine/Aviation Use Restriction [3]	551	21%	29	2%	0	0%	580	12%
Quake Hazard/Unstable Soils	923	34%	763	51%	39	5%	1,725	35%
Total	**2,685**	**100%**	**1,500**	**100%**	**724**	**100%**	**4,909**	**100%**

Notes:
[1] Properties within one-quarter mile of arterial roadway with level of service at or below "intolerable conditions" according to Metro Regional Transportation Plan, 1998 analysis.
[2] Properties held for internal corporate expansion, or owned by Port of Portland and subject to long-term lease only provisions (excludes properties counted in marine/aviation restriction category).
[3] Properties controlled by Port of Portland, and subject to marine or aviation use restrictions.
Source: compiled by Otak, Inc. based on GIS data and interviews.

Metro UGB Industrial Land Needs

In a review of Metro UGB industrial demand-supply balance, the forecasted land demand in the three-county Metro area has been allocated to the UGB using current Metro Data Resources Center forecasts for non-retail employment. The results of the Metro UGB analysis are indicated below in Table D-3

Table D-3 presents a similar comparison of industrial demand and supply in the Metro UGB, and indicates that the forecasted 20-year industrial land absorption is 4,165 acres.

According to this study's industrial supply and demand findings, the Tier A industrial supply of 972 acres in the Metro UGB is well below the 20-year net absorption forecasts (4,165 acres).

Table D-3: Summary of Industrial Land Demand and Supply (acres)
Portland Metro Planning Boundary Forecast 2000 to 2020

	DEMAND	SUPPLY	
Metro Subarea	***Minimum Land Needs***	***Available Industrial Land***	***Available Tier A Land***
Clackamas	**1,351**	600	**47**
Multnomah	**813**	2,572	**442**
Washington	**2,001**	1,643	**483**
Total Net Acres	**4,165**	4,815	**972**

Step-Wise Demand Methodology

Another way to evaluate industrial land requirements for the Metro UGB is to combine the findings of this study with assumptions from recent Metro regional planning efforts. By using the step-by-step methodology described in Table D-4 the tri-county regional industrial job growth forecasts have been converted into 20-year Metro UGB industrial land requirements.

The findings using the step-wise methodology indicate that if job growth forecasts are to be met, the Metro UGB requires approximately 13,630 gross acres of industrial land. Without the amount of land needed to achieve land supply elasticity, the Metro UGB gross industrial land needs would be on the order of 6,815 acres (50 percent elasticity factor * 13,630 = 6,815) – however, even without an elastic land supply, the UGB's ability to fully accommodate job growth forecasts would be unlikely.

Appendix E -- Industrial Supply Maps

Regional Industrial Lands Study

Urban Clackamas County
Vacant & Redevelopable
Industrial Lands
June 15, 1999

Vacant Industrial Lands
- Tier A
- Tier B
- Tier C Infill
- Tier C Overvalued
- Potentially Redevelopable (Greater Than 5 Acres)
- Marine, Air or Transportation
- Metro Area Boundary
- Urban Growth Boundary
- County Boundary
- City Boundary

1" = 2600'

Regional Industrial Lands Study

Urban Clackamas County
Vacant & Redevelopable
Industrial Lands
June 15, 1999

Vacant Industrial Lands
- Tier A
- Tier B
- Tier C Infill
- Tier C Overvalued
- Potentially Redevelopable (Greater Than 5 Acres)
- Marine, Air or Transportation
- Metro Area Boundary
- Urban Growth Boundary
- County Boundary
- City Boundary

1" = 2400'

Regional Industrial Lands Study

Urban Clackamas County
Vacant & Redevelopable
Industrial Lands
June 15, 1999

Vacant Industrial Lands
- Tier A
- Tier B
- Tier C Infill
- Tier C Overvalued
- Potentially Redevelopable (Greater Than 5 Acres)
- Marine, Air or Transportation
- Metro Area Boundary
- Urban Growth Boundary
- County Boundary
- City Boundary

1" = 2200'

Regional Industrial Lands Study

Urban Multnomah County
Vacant & Redevelopable
Industrial Lands
June 15, 1999

Vacant Industrial Lands
- Tier A
- Tier B
- Tier C Infill
- Tier C Overvalued
- Potentially Redevelopable (Greater Than 5 Acres)
- Marine, Air or Transportation
- Metro Area Boundary
- Urban Growth Boundary
- County Boundary
- City Boundary

1" = 3600'

Regional Industrial Lands Study

Urban Multnomah County
Vacant & Redevelopable
Industrial Lands
June 15, 1999

Vacant Industrial Lands

- Tier A
- Tier B
- Tier C Infill
- Tier C Overvalued
- Potentially Redevelopable (Greater Than 5 Acres)
- Marine, Air or Transportation
- Metro Area Boundary
- Urban Growth Boundary
- County Boundary
- City Boundary

1" = 3200'

Regional Industrial Lands Study

Urban Multnomah County
Vacant & Redevelopable
Industrial Lands
June 15, 1999

Vacant Industrial Lands

- Tier A
- Tier B
- Tier C Infill
- Tier C Overvalued
- Potentially Redevelopable (Greater Than 5 Acres)
- Marine, Air or Transportation
- Metro Area Boundary
- Urban Growth Boundary
- County Boundary
- City Boundary

1" = 3400'

Regional Industrial Lands Study

Urban Washington County
Vacant & Redevelopable
Industrial Lands
June 15, 1999

Vacant Industrial Lands
- Tier A
- Tier B
- Tier C Infill
- Tier C Overvalued

Potentially Redevelopable (Greater Than 5 Acres)

Marine, Air or Transportation

- Metro Area Boundary
- Urban Growth Boundary
- County Boundary
- City Boundary

King City

Durham

Tualatin

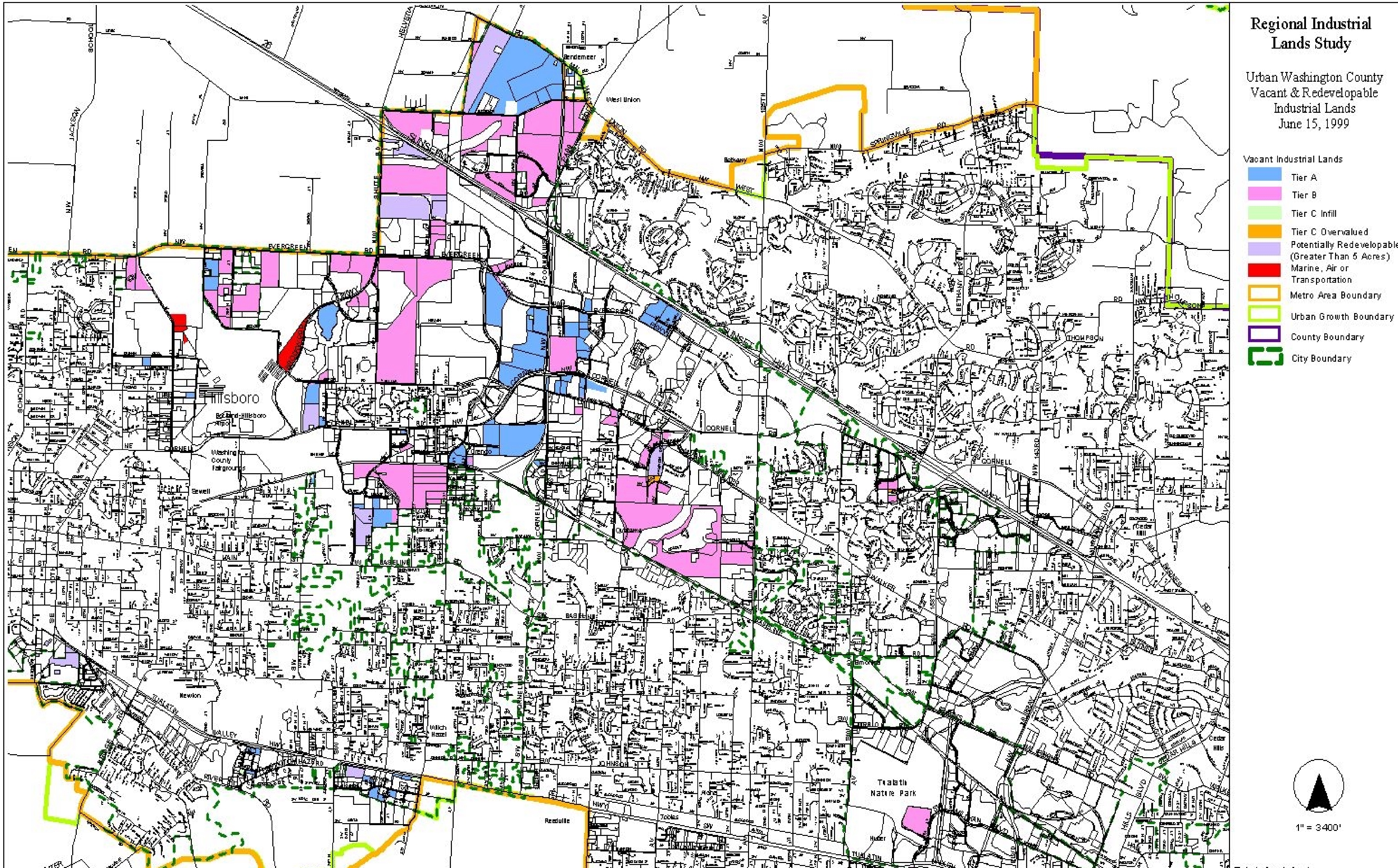
Sherwood

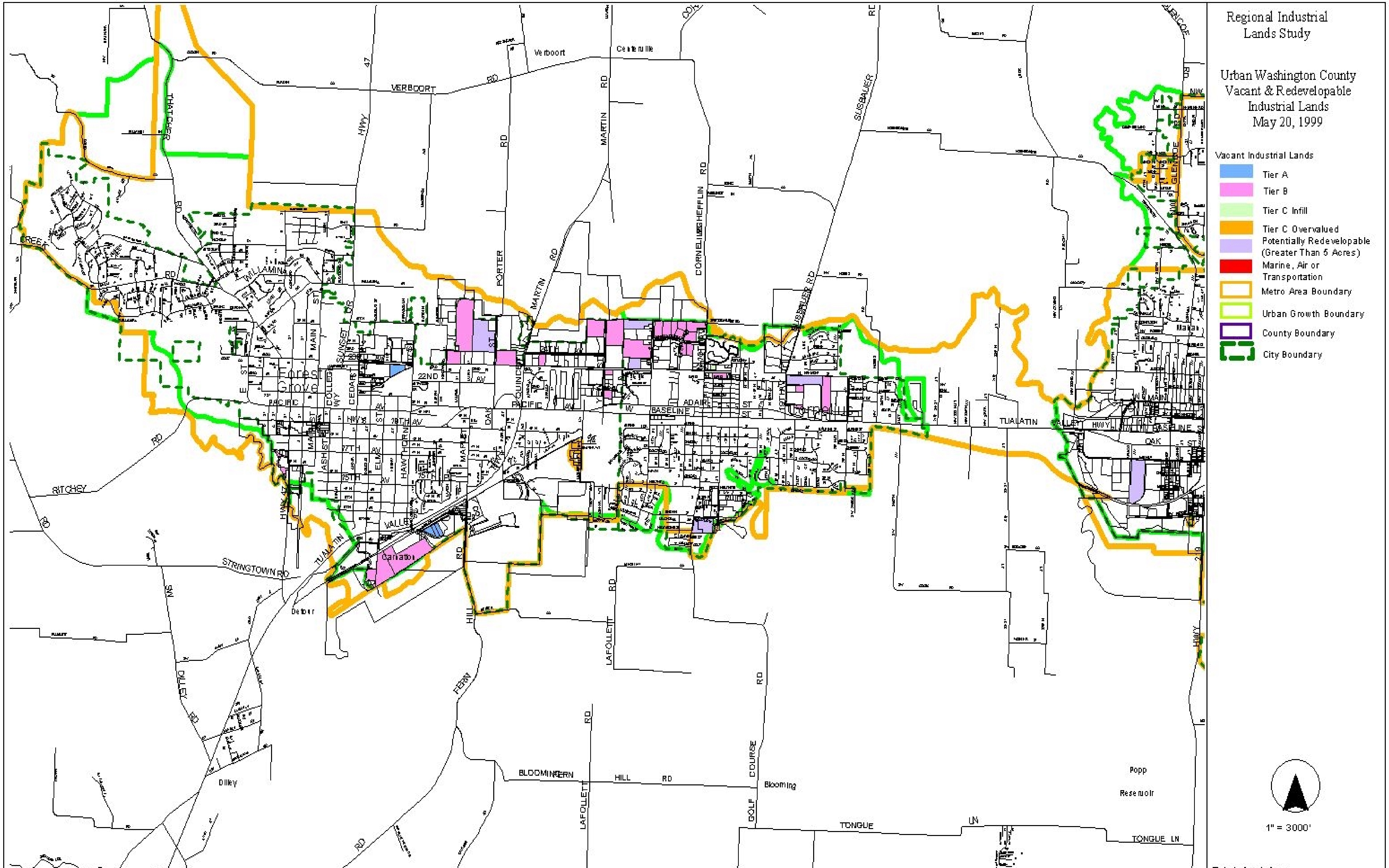
Tonquin

Onion Flat

Middleton

1" = 3400'


Regional Industrial Lands Study
Urban Washington County
Vacant & Redevelopable
Industrial Lands
June 15, 1999
Vacant Industrial Lands
Tier A
Tier B
Tier C Infill
Tier C Overvalued
Potentially Redevelopable (Greater Than 5 Acres)
Marine, Air or Transportation
Metro Area Boundary
Urban Growth Boundary
County Boundary
City Boundary
1" = 3400'
Hillsboro
Washington County Fairgrounds
West Union
Bethany
Newton
Witch Hazel
Reedville
Tualatin Nature Park
Cedar Mill
Cedar Hills
EVERGREEN
CORNELL
BASELINE
SUNSET
TUALATIN VALLEY HWY
SPRINGVILLE RD
BETHANY
WALKER
THOMPSON


Regional Industrial
Lands Study
Urban Washington County
Vacant & Redevelopable
Industrial Lands
May 20, 1999
Vacant Industrial Lands
Tier A
Tier B
Tier C Infill
Tier C Overvalued
Potentially Redevelopable
(Greater Than 5 Acres)
Marine, Air or
Transportation
Metro Area Boundary
Urban Growth Boundary
County Boundary
City Boundary
1" = 3000'
Verboort
Centerville
VERBOORT RD
THATCHER RD
HWY 47
PORTER RD
MARTIN RD
CORNELIUS SCHEFFLIN RD
SUSBAUER RD
GLENCOE RD
CREEK RD
WILLAMINA AV
Forest Grove
MAIN ST
SUNSET DR
COLLEGE WY
CEDAR ST
PACIFIC AV
22ND AV
19TH AV
QUINCE ST
ADAIR ST
BASELINE ST
TUALATIN VALLEY HWY
OAK ST
W MAIN
HAWTHORN
ELM
ASH ST
MAPLE
RITCHEY RD
STRINGTOWN RD
Cornelius
Dilley
DILLEY RD
Detour
FERN HILL RD
LAFOLLETT RD
GOLF COURSE RD
BLOOMING FERN HILL RD
Blooming
TONGUE LN
Popp
Reservoir
Malnar

Appendix F -- Public Involvement Record

Regional Industrial Lands Study
Open House Workshop - Metro
April 1, 1999

Attendance Roster

Name	Representing	Telephone #
Stephan Lashbrook	City of Wilsonville PO Box 1282, Wilsonville OR 97070	570-1581
John Leeper	Washington County Citizen	643-2811
Doug Rux	City of Tualatin PO Box 369 Tualatin OR 97062	692-2000
Mark Turpel	Metro	797-1734
Elaine Wilkerson	Metro	797-1738
Jim Sitzman	DLCD 800 NE Oregon #18 Portland OR 97232	731-4065 x 23
Rich Faith	City of Troutdale 104 SE Kibling Ave. Troutdale OR	665-5175
Marcus Simantel	Agri Business Council of Oregon 31665 NW Scotch Church Rd. Hillsboro OR 97124	241-1487 648-0925
Brian Shetterly	City of Gresham	618-2529
Dick Bolen	Metro	797-1582
Michael Morrissey	Metro	797-1907
Paul Carlson	Cushman & Wakefield 200 SW Market St. #200 Portland OR 97201	279-1755
Chuck Cota	Cushman & Wakefield 200 SW Market St. #200 Portland OR 97201	279-1701
Mark Childs	Integrated Commercial 4800 SW Macadam Portland OR 97201	228-4800
David Rankin	Golder Associates	241-9404
Linda McDonnell	Daily Journal of Commerce	221-3314

Karen Buehrs	Clackamas County 902 Abernethy Rd Oregon City OR 97045	557-6381
Dr. Catherine Lawson	PSU - TRG PO Box 751 Portland OR 97207	725-3312
Bill Atherton	Metro Council	797-1887
Craig Zell	Appraiser 4850 SW Schools Ferry Rd. Portland OR 97225	297-2340
David Hill	Palmer, Groth, & Pietka Appraiser 110 SW Yamhill #200 Portland OR 97204	226-0983
James Price	Metro	280-5429

Exit Survey Questions and comments:

1. Do you have specific recommendations on how to improve the overall method used to measure and evaluate the supply of industrial land?

    4 No, the method used is fine.

    1 Unsure of proposed method.

    5 Yes, I have the following recommendations:

Find a better way to define the difference between red and blue areas, from a marketability standpoint, the name "constrained" and the color "red" give perception of not available.

Remove "competitive" from Tier A. The word insinuates you could obtain "non-competitive" property from Tier B. How will the word "Constrained" relate to supplies 5 + years from now.

Contact various RE groups to quantify the preliminary information prior to the May draft.

Physical inspections and personal confirmation of larger parcels to determine Tier designations.

Clarify lands which are within the UGB, but outside city limits as to tier classification. Clear definitions as to what is redevelopable.

2. Are there parcel/property specific industrial supply additions or deletions you would like to see made to the draft supply database?

    0 No, the supply database looks fine.

    2 Unsure at this time

6 Yes, but my comments were already relayed to your project staff.

2 Yes, I have the following additional recommendations.

Yes, but I need more time with the maps.

Could update using Metro's new vacant land inventory to be available at the end of month (April)

Send maps to SIOR for review.

3. Do you think the proposed demand methodology will be effective in determining long-term industrial land needs?

4 Yes, the demand method looks fine.

5 Unsure at this time

0 No, I have the following recommendations:

I am concerned about assumptions regarding building densities for industrial uses.

At first pass… Probably could use refinement.

The tier method is good - will help define today's, tomorrow's, and not available at any time price sites.

4. What are your preferences for how we can best communicate findings from the Portland Regional Industrial Land Study?

This was a good opportunity. A similar mailing/ format would work.

Brief summary report and open house with scheduled speakers.

Obtain/ Create absorption rates - translate to available supply, % growth capability; Avoid Metro? Use Press?
Contact Associations, i.e. : Realtors, owners, managers

It would be helpful to see the changes made on the maps from the open house. Additionally, having a written description on methodology. Providing material for jurisdictions to share with Council/ Commission would be beneficial.

5. Additional Comments?

Please supply maps of the Wilsonville area as soon as possible. (Clackamas & Washington County areas) Please include methodology information to explain the tier categories.

Good job so far.

Total acreage on maps for each Tier.

I am glad to see the mapping being done. Obviously, Tier B is quite large and I believe it should not be listed as not available. My farmland is not available either. My fear is that the study will be used to take in more farmland.

General Concerns/ Comments:

- Concern over low density corporate industrial campus development
- What is the RILS project's relationship to SB 87? Better not be one! Metro and larger cities do not need to be told how to plan.
- "Competitive vacant" is a value judgment. This (Tier A) should just be "vacant". Same with "overvalued".
- 33% overvalued: $1,000 in improvements, > 1 acre and total value @ less that $3/ sq. ft. are factors which differentiate and can be argued with. Market versus government policy implications.
- Low density job industrial - bad e.g. Clackamas warehouses.

Written Responses to the open house:

Marcus Simatel, Hillsboro OR:

In 1998 Clayton Hannon of the Oregon Nurserymen and I were asked to participate in a meeting on this topic. We both shared our concerns that farmlands are already industrial lands. Oregon agriculture accounts for over 10% of Oregon's GSP. The bottom line for ag. Is a supply of land for production. When that land is looked at as just "open land" or as "undeveloped" land, people are operating under misconceptions.

Oregon ag has grown in 11 out of the last 12 years. It is a stabilizing influence on Oregon's economy. It also produces new product year after year - for centuries - even millenniums. Long-term thinking is necessary.

A very close look should be taken at current strategies of commercial and industrial development. The "campus" approach, especially when large tracts are held for "future expansion", are responsible for much of the sprawl we see in Washington County. (I would define "future expansion" as land speculation). It seems rather obvious that we need to make better uses of the lands currently designated commercial and / or industrial.

Mandating a 20 year supply of land - for any non-farm use is a sure way to eventually us up the most essential need or Oregon Agriculture - land.

Sincerely,

Marcus Simantel
Washington County Farmer
Immediate Past President
Agri Business Council of Oregon
31665 NW Scotch Church Rd

Hillsboro OR 97124
503-241-1487
503-648-0925

Mark Turpel, Metro, Manager Long Range Planning

Thank you for the opportunity for review and comment at your open house today. I'm responding via this memo rather than your exit survey for my own convenience (I think better typing on my computer than writing out by hand), but I think my comments address your questions.

1. *Your study includes all land in the greater metropolitan area, including Clackamas, Clark, Multnomah, and Washington counties - substantial more that the City of Portland. Another project title (Region-wide Industrial Land Study, Four County Industrial Land Study, etc.) might demonstrate the breadth of your analysis.*

2. *The maps do not appear to reflect areas that may be designated on comprehensive plans, but may not yet be zoned. An example of this would be the Port of Portland's industrial property on Hayden Island slated for a marine terminal. I think there may be other examples of this within the region as well, particularly for those jurisdictions with a two map system.*

3. *The largest industrial properties in Clark County - the Vancouver Lake are - are not shown on the map. It also appears that other lands east of 164th in east county are not included.*

4. *Because of items 2 and 3, it may be useful to show on some map the total areas designated for industrial and that portion already developed. The numbers could then be cross checked to ensure all industrial lands currently designated are addressed.*

5. *While it is not in the Metro urban growth boundary, there is a large area of rural industrial that is between Tualatin and Wilsonville that does not appear to be addressed.*

6. *Metro urban reserve area 44, currently a gravel extraction site and zoned EFU, is slated for inclusion into the UGB. It is my understanding that the City of Tualatin has indicated a preference for industrial for this area. While this is not a sure thing by any means, it seems to me that this could be in some sort of provisional category - as could other urban reserve areas, such as those in the sound of Sunnyside/ Sunrise Corridor area which have a Metro 2040 designation for employment.*

7. *I'm not sure how you account for this, but at any one time, there are built facilities that are vacant and available. I think the H-P site in Vancouver is vacant and for sale now and there may be several in the Sunset corridor. In addition, there are infill redevelopment opportunities outside the industrial inventory that may be available. An example of this could be something like the new Adidas campus for 550 employees on the 13.75 acre old Bess Kaiser Hospital site in North Portland. While this may not be industrial in the sense of manufacturing, such sites could take some of the pressure off industrial sites to house administrative, marketing, and other office type functions of manufacturing firms.*

8. *Your environmental overlay, as I understand it, includes the Title 3, Floodplain and Water Quality, setbacks (primarily 0, 15 or 50 foot setbacks from the top of the stream bank). However, Metro has assumed a 200 foot (either side) from the stream center in its jobs and housing capacity analysis to account for Goal 5 and Steelhead/Salmon Endangered Species listings. The possible impact to your inventory if something like even a 100 foot setback*

could be substantial. In some way, visually on your maps and certainly in the analysis, this issue should be addressed. While Title 3 does not apply in Clark County, the Steelhead/salmon listing does. It will likely require larger setbacks even if a floodplain and water quality approach like Title 3 were required in Clark County.

Thank you for your consideration of the above.

Regional Industrial Lands Study
Open House Workshop - Vancouver, Clark County
April 14, 1999

Attendance Roster

Name	Representing	Telephone #
Gunars Kilpe	Retired SHE - America, Inc. 12203 NE 163rd St. Brush Prairie WA 98606	360-892-4940
Patrick Greene	CREDC 100 E. Columbia Way Vancouver WA 98661	360-694-5006
Oliver Orijako	Clark County	360-397-2375
Scott Fraser	Grubb & Ellis SIOR 1000 SW Broadway St. Suite 1000 Vancouver WA 98660	360-699-6092
Peter F. Fry	2153 SW Main St. #104 Portland OR 97205	503-274-2744
Randy Reuter	Norris, Beggs & Simpson 805 Broadway #700 Vancouver WA 98660	360-690-4529
Ron Kawamoto	Norris, Beggs & Simpson 805 Broadway #700 Vancouver WA 98660	360-690-4525
Chuck Martin	944 SE Sellwood Blvd. Portland OR 97202	503-230-9401
Kelly Shea	C.B. Commercial 108 E. Mill Plain Blvd. Vancouver WA	360-699-4494
Ron Blegen	Golder Associates 4522 SW Water Ave. Suite 100 Portland OR 97201	503-241-9404
Bill Connelly	Eric Fuller & Associates	
Tom Vanderzanden	Clackamas County 902 Abernathy Rd. Oregon City OR 97045	503-655-8521

Exit Survey Questions and comments:

1. Do you have specific recommendations on how to improve the overall method used to measure and evaluate the supply of industrial land?

    5 No, the method used is fine.

    2 Unsure of proposed method.

    3 Yes, I have the following recommendations:

Before classifying land as suitable for industry, make sure soil classifications allow for 3000 lb./sq. in.. bearing. Water table is at least 12' down, and there are significant buffers from $300-$400,000 tract mansions. Some industries work 24hrs/day, 7 days a week.

Would like to be notified of next level of study.

Overvalued and infill is an oxymoron. You infill on undervalued parcels, not overvalued. Identify the different types of industry specifically emerging industry and evolution of industrial firms.

2. Are there parcel/property specific industrial supply additions or deletions you would like to see made to the draft supply database?

    0 No, the supply database looks fine.

    2 Unsure at this time

    6 Yes, but my comments were already relayed to your project staff.

    2 Yes, I have the following additional recommendations.

Need to talk with Renate Mengelberg at Clackamas County.

Ridgefield area Keller property in east Clark County.

3. Do you think the proposed demand methodology will be effective in determining long-term industrial land needs?

    2 Yes, the demand method looks fine.

    4 Unsure at this time

    1 No, I have the following recommendations:

Need larger parcels away from residential.

4. What are your preferences for how we can best communicate findings from the Portland Regional Industrial Land Study?

Newspapers, TV

Communicate in more detail to all brokers what the workshop is about.

Open houses and meeting at our industrial meeting at Norris, Biggs, and Simpson.

Newsletter, media, community workshops.

5. Additional Comments?

The quality of this information degrades quickly so I would encourage completing the study quickly and distribute findings (and maybe raw data) quickly. Good work! Thanks!

Need to have another workshop.

Thank you for the open house process!

General Concerns/ Comments:

- What about vacant buildings, zoned industrial, such as Portland Central Eastside? How do you factor for these? 500,000 sq. ft. vacant available building and some acreage - check with PDC.
- Is the study being driven by RE industry or industry?
- How much, if any, of Columbia Corridor is within the 100-yr flood plain?
- Does Metro's database include FEMA 100-yr. Flood plain and or 1996 inundation, per Title-3?
- Request adding UGA's to Clark County maps
- Need to calculate available industrial outside UGA's: Industrial reserve areas (rural); Comp plan industrial
- Call Harry Chapen regarding 6 industrial sanctuaries in Portland. Invite participants to May 5 meeting.